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(21)Application number : 2000-082513 (71)Applicant : TOPPAN PRINTING CO LTD(22)Date of filing : 23.03.2000 (72)Inventor : KAWAHARA MIKIRO

(54) SYSTEM AND METHOD FOR FORMING IMAGE AND RECORDED MATTER

(57)Abstract:

PROBLEM TO BE SOLVED: To plurally distribute and record various information and to easily reproduce them.

SOLUTION: This image forming system is provided with a means for inputting an image to be embedded and an image for embedding a share pattern being color images or gradation images as image data, a means for generating the share pattern obtained by distributing the image to be embedded and a means for embedding the share pattern into the image for embedding the share patterns to generate a share image.

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CLAIMS

[Claim(s)]

[Claim 1] The image generative system characterized by providing a means to input the embedding-ed image which is an embedding image, a color picture, or a shade image as image data, a means to generate the share pattern which distributed the embedding image, and a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[Claim 2] By making one or more auxiliary pixels equivalent to a means to input the embedding-ed image which are an embedding image and a color picture as image data, and each pixel of an embedding image By deleting the pixel of the embedding-ed image corresponding to a part for the specific color part of a means to generate the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern, and making it transparence The image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[Claim 3] By means to input the embedding-ed image which are an embedding image and a color picture as image data, and to amend the gradation of an embedding image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image By deleting the pixel of the embedding-ed image corresponding to a part for the specific color part of a means to generate the share pattern by which gradation amendment was carried out and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern, and making it transparence The image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[Claim 4] By making one or more auxiliary pixels equivalent to a means to input the embedding-ed image which are an embedding image and a color picture as image data, and each pixel of an embedding image It transposes to a means to generate the share pattern which distributed the embedding image, and the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share pattern was set by arbitration. The image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[Claim 5] By means to input the embedding-ed image which are an embedding image and a color picture as image data, and to amend the gradation of an embedding image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image A means to generate the share pattern by which gradation amendment was carried out and which it embedded [pattern] and distributed the image, The image generative system characterized by providing a means to transpose to the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share

pattern was set by arbitration, to embed a share pattern in an embedding-ed image, and to generate a share image.

[Claim 6] By making one or more auxiliary pixels equivalent to a means to input the embedding-ed image which are an embedding image and a pattern image of a color as image data, and each pixel of an embedding image By moving a means to generate the share pattern which distributed the embedding image, and the pixel of an embedding-ed image, based on one or more auxiliary pixels to which a share pattern corresponds The image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[Claim 7] The image generative system characterized by providing a means to generate the share pattern which distributed the embedding image by making one or more auxiliary pixels equivalent to a means to input an embedding image as image data, and each pixel of an embedding image, and a means to make a hole in the part corresponding to the auxiliary pixel of the specific color of a share pattern, and to output a share to a medium.

[Claim 8] The image generative system characterized by providing a means to make also embed additional information using the redundancy which exists in the response, and to generate a share pattern while making one or more auxiliary pixels equivalent to a means to input an embedding image as image data, a means to memorize additional information, and each pixel of an embedding image, embedding and distributing an image.

[Claim 9] By making one or more auxiliary pixels equivalent to a means to input an embedding image as image data, a means to memorize additional information, and each pixel of an embedding image A means to generate the share pattern which distributed the embedding image, and a means to express additional information by the two-dimensional pattern, and to divide into the auxiliary pixel of the specific color of a share pattern, The image generative system characterized by providing a means to generate a share image, by superimposing the two-dimensional pattern expressing the divided additional information corresponding to each auxiliary pixel of the specific color of a share pattern.

[Claim 10] A means to input the embedding-ed image which are an embedding image and a color picture as image data, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of a means to generate the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern was embedded, and making it transperence The image generative system characterized by providing a means to embed a share pattern in the embedding-ed image with which the digital watermark was embedded, and to generate a share image.

[Claim 11] A means to input the embedding-ed image which are an embedding image and a color picture as image data, and to amend the gradation of an embedding image, The digital watermark expressing additional information by the means embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of a means to generate the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern was embedded, and making it transperence The image generative system characterized by providing a means to embed a share pattern in the embedding-ed image with which the digital watermark was embedded, and to generate a share image.

[Claim 12] A means to input the embedding-ed image which are an embedding image and a color picture as image data, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of

an embedding image It transposes to the color to which the pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was determined as a means to generate the share pattern which distributed the embedding image by arbitration. The image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[Claim 13] A means to input the embedding-ed image which are an embedding image and a color picture as image data, and to amend the gradation of an embedding image, The digital watermark expressing additional information by the means embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image A means to generate the share pattern by which gradation amendment was carried out and which it embedded [pattern] and distributed the image, The image generative system characterized by providing a means to transpose to the color to which the pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was set by arbitration, to embed a share pattern in an embedding-ed image, and to generate a share image.

[Claim 14] A means to input the embedding-ed image which are an embedding image and a pattern image of a color as image data, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image By moving the pixel of a means to generate the share pattern which distributed the embedding image, and the embedding-ed image which had the digital watermark embedded based on one or more auxiliary pixels to which a share pattern corresponds The image generative system characterized by providing a means to embed a share pattern in the embedding-ed image which had the digital watermark embedded, and to generate a share image.

[Claim 15] By making one or more auxiliary pixels equivalent to a means to input the embedding-ed image which are an embedding image and a shade image as image data, the means which carries out bottom raising of the number of pixels of the whole embedding-ed image, and each pixel of an embedding image A means to generate the share pattern which distributed the embedding image, and when it rasterizes an embedding image and a halftone dot is generated By embedding so that the include angle of a halftone dot may be set up according to the color of the auxiliary pixel of the share pattern corresponding to each halftone dot, and adjusting an image The image generative system characterized by providing a means to embed a share pattern in an embedding image and to generate a share image, and a means to rasterize a share image.

[Claim 16] Claims 1-6, the image generative system of 9-14 given in any 1 term which are characterized by providing a means to output a share, based on a share image.

[Claim 17] The image generative system according to claim 8 characterized by providing a means to output a share, based on a share pattern.

[Claim 18] The image generative system according to claim 15 characterized by providing a means to output a share, based on the rasterized share image.

[Claim 19] Claim 7, the image generative system of 16-18 given in any 1 term which are characterized by providing a means to give the device which makes playback easy to a share.

[Claim 20] The image generative system given in claim 19 term characterized by the above-mentioned device being adding the mark for alignment to a share.

[Claim 21] The image generative system given in claim 19 term characterized by the above-mentioned device being applying adhesion material to one side of a share.

[Claim 22] The image generative system according to claim 19 characterized by the above-mentioned device being detaching spacing of pixels before that when outputting a share.

[Claim 23] The image generation method characterized by including the process which inputs the embedding-ed image which is an embedding image, a color picture, or a shade image as image data,

the process which generates the share pattern which distributed the embedding image, and the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[Claim 24] By the process which inputs the embedding-ed image which are an embedding image and a color picture as image data, and making one or more auxiliary pixels equivalent to each pixel of an embedding image By deleting the pixel of the embedding-ed image corresponding to a part for the specific color part of the process which generates the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern, and making it transperence The image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[Claim 25] By the process which inputs the embedding-ed image which are an embedding image and a color picture as image data, and amends the gradation of an embedding image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image By deleting the pixel of the embedding-ed image corresponding to the specific color of the process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern, and making it transperence The image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[Claim 26] By the process which inputs the embedding-ed image which are an embedding image and a color picture as image data, and making one or more auxiliary pixels equivalent to each pixel of an embedding image It transposes to the process which generates the share pattern which distributed the embedding image, and the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share pattern was set by arbitration. The image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[Claim 27] By the process which inputs the embedding-ed image which are an embedding image and a color picture as image data, and amends the gradation of an embedding image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image The process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, The image generation method characterized by including the process which transposes to the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share pattern was set by arbitration, embeds a share pattern in an embedding-ed image, and generates a share image.

[Claim 28] By the process which inputs the embedding-ed image which are an embedding image and a pattern image of a color as image data, and making one or more auxiliary pixels equivalent to each pixel of an embedding image By the process which generates the share pattern which distributed the embedding image, and moving the pixel of an embedding-ed image based on one or more auxiliary pixels to which a share pattern corresponds The image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[Claim 29] The image generation method characterized by including the process which generates the share pattern which distributed the embedding image by the process which inputs an embedding image as image data, and making one or more auxiliary pixels equivalent to each pixel of an embedding image, and the process which makes a hole in the part corresponding to the auxiliary pixel of the specific color of a share pattern, and outputs a share to a medium.

[Claim 30] The image generation method characterized by including the process which is made to also embed additional information using the redundancy which exists in the response, and generates a share pattern while making one or more auxiliary pixels equivalent to the process which inputs an

embedding image as image data, the process which memorizes additional information, and each pixel of an embedding image, embedding and distributing an image.

[Claim 31] By the process which inputs an embedding image as image data, the process which memorizes additional information, and making one or more auxiliary pixels equivalent to each pixel of an embedding image The process which generates the share pattern which distributed the embedding image, and the process which expresses additional information by the two-dimensional pattern, and is divided into the auxiliary pixel of the specific color of a share pattern, The image generation method characterized by things including the process which generates a share image by superimposing the two-dimensional pattern expressing the divided additional information corresponding to each auxiliary pixel of the specific color of a share pattern.

[Claim 32] The process which inputs the embedding-ed image which are an embedding image and a color picture as image data, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of the process which generates the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern was embedded, and making it transparence The image generation method characterized by including the process which embeds a share pattern in the embedding-ed image with which the digital watermark was embedded, and generates a share image.

[Claim 33] The process which inputs the embedding-ed image which are an embedding image and a color picture as image data, and amends the gradation of an embedding image, The digital watermark expressing additional information by the means embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of the process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern was embedded, and making it transparence The image generation method characterized by including the process which embeds a share pattern in the embedding-ed image with which the digital watermark was embedded, and generates a share image.

[Claim 34] The process which inputs the embedding-ed image which are an embedding image and a color picture as image data, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image It transposes to the color to which the pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was determined as the process which generates the share pattern which distributed the embedding image by arbitration. The image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[Claim 35] The process which inputs the embedding-ed image which are an embedding image and a color picture as image data, and amends the gradation of an embedding image, The digital watermark expressing additional information by the process embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image The process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, The image generation method characterized by including the process which transposes to the color to which the pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was set by arbitration,

embeds a share pattern in an embedding-ed image, and generates a share image.

[Claim 36] The process which inputs the embedding-ed image which are an embedding image and a pattern image of a color as image data, By the process which embeds the digital watermark expressing additional information in an embedding-ed image, and making one or more auxiliary pixels equivalent to each pixel of an embedding image By the process which generates the share pattern which distributed the embedding image, and moving the pixel of the embedding-ed image which had the digital watermark embedded based on one or more auxiliary pixels to which a share pattern corresponds The image generation method characterized by including the process which embeds a share pattern in the embedding-ed image which had the digital watermark embedded, and generates a share image.

[Claim 37] By the process which inputs the embedding-ed image which are an embedding image and a shade image as image data, the process which carries out bottom raising of the number of pixels of the whole embedding-ed image, and making one or more auxiliary pixels equivalent to each pixel of an embedding image The process which generates the share pattern which distributed the embedding image, and when it rasterizes an embedding image and a halftone dot is generated By embedding so that the include angle of a halftone dot may be set up according to the color of the auxiliary pixel of the share pattern corresponding to each halftone dot, and adjusting an image The image generation method characterized by including the process which embeds a share pattern in an embedding image and generates a share image, and the process which rasterizes a share image.

[Claim 38] Claims 23-28, the image generation method of 31-36 given in any 1 term which are characterized by including the process which outputs a share based on a share image.

[Claim 39] The image generation method according to claim 30 characterized by including the process which outputs a share based on a share pattern.

[Claim 40] The image generation method according to claim 37 characterized by including the process which outputs a share based on the rasterized share image.

[Claim 41] Claim 29, the image generation method of 38-40 given in any 1 term which are characterized by including the process which gives the device which makes playback easy to a share.

[Claim 42] The image generation method given in claim 41 term characterized by the above-mentioned device being adding the mark for alignment to a share.

[Claim 43] The image generation method according to claim 41 characterized by the above-mentioned device being applying adhesion material to one side of a share.

[Claim 44] The image generation method according to claim 41 characterized by the above-mentioned device being detaching spacing of pixels before that when outputting a share.

[Claim 45] The record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets on which the color or the shade image is recorded, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[Claim 46] The record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets on which the pattern image of a color is recorded, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[Claim 47] The record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets which the hole is opening, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[Claim 48] The record object characterized by an image being recorded, embedding if the share of k or more sheets is piled up among the shares of n sheets as which the additional information which is not in sight by arrangement of each pixel with the naked eye is expressed, only for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[Claim 49] The record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets to which the share of the image of a color with which the digital

watermark expressing additional information is embedded is carried out, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[Claim 50] The record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets on which the pattern image of a color with which the digital watermark expressing additional information is embedded is recorded, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[Claim 51] The record object characterized by embedding even if it will embed when moire occurs, and an image will appear and it will pile up the share of less than k sheets, if the share of k or more sheets is piled up among the shares of n sheets on which the shade image is recorded, and an image not appearing.

[Claim 52] The record object of claim 45-51 characterized by having given the device which makes playback easy to a share given in any 1 term.

[Claim 53] The record object according to claim 52 characterized by the above-mentioned device being having added the mark for alignment to the share.

[Claim 54] The record object according to claim 52 characterized by the above-mentioned device being having applied adhesion material to one side of a share.

[Claim 55] The record object according to claim 52 characterized by being that spacing of the pixels on which the share is recorded for the above-mentioned device is separated.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention can be used suitable to conceal by distributing the image especially about the technique of concealing an image including information recording. The image which includes information to record on these descriptions In addition, an "embedding image" and a call, Two or more images which distributed the "embedding-ed image", and a call and an "embedding image" for the image with which information is embedded A "share pattern" and a call, The record object obtained based on the "share image", and a call and a "share image" in the image which embedded the "share pattern" in the "embedding-ed image" will be called a "share." Furthermore, the meeting of a "share image group", a call, and a "share" is called [the meeting of a "share pattern"] a "share group" for the meeting of a "share pattern group", a call, and a "share image." Moreover, it shall express, saying the actuation an embedding image is made to be in sight of human being "is reproduced."

[0002]

[Description of the Prior Art] Conventionally, the reference which indicated it for the technique of concealing the image expressing information is mentioned, and it explains below.

[0003] (1) Kato **** Imai [Hideki]: -- "escape configuration method of vision decode mold secrecy variational method":Institute of Electronics, Information and Communication Engineers paper magazine A Vol.J79-A No.8 pp.1344-1351 -- a significant image will be reproduced, if this technique forms the random image of black and white of two or more sheets and these are piled up It is the technique of the ability to distribute secrecy not only combining the image of two sheets but combining the image of three or more sheets. If secrecy is distributed in two or more images, even if only one in two or more images comes to hand, it is impossible to get to know the information about other images entirely. Therefore, only what can obtain two or more sheets simultaneously can reproduce information, and becomes possible [carrying out distributed preservation of the secrecy] at insurance.

[0004] (2) An additional image is reproduced by the technique of *****9-248935***** by superimposing and recording another additional image on a certain main image, and piling up the image and pattern image. It has in the description that information is recordable into a color picture in the form which cannot be easily perceived by human being.

[0005] (3) Kineo Matsui: -- the "digital watermark":Institute of Image Electronics Engineers of Japan -- volume [26th] No. 3 (1997)

This technique reads a digital watermark by putting in and recording a digital watermark on digital data, and performing predetermined decode processing. As an approach of putting a digital watermark especially into a static image, the approach of of a "pixel space utilization mold", a "frequency-domain utilization mold", a "statistic utilization mold", etc., etc. is learned.

[0006]

[Problem(s) to be Solved by the Invention] With the technique of (1), it consisted of only monochrome random patterns, and a significant image was not able to be superimposed on another image and record/playback of it were not able to be done. For example, the significant image with which the alphabetic character was drawn was not able to be superimposed on another landscape etc. For the reason, there was a problem that neither power of expression nor appearance was good etc.

[0007] The technique of (2) was premised on using what has mainly high redundancy, such as a natural image, for a main image, and it was difficult to be adapted for images with low redundancy, such as a pattern image which put the small image in order. Moreover, this technique is premised only on using the image used as the pair of two sheets, and was not able to enable complicated playback combining the image of three or more sheets.

[0008] moreover -- if the technique of (1) and (2) is copied with a copy machine -- the thing of an original copy -- ** -- the same effectiveness had been acquired. In addition, as a common technical problem, as a medium to record, a transparent thing is required and the adapted medium may have been restricted.

[0009] Commercial utilization of the technique of (1) and (2) was not actually carried out from an expression being scarce and an adaptation medium being restricted etc., having the big description that it can decode simple.

[0010] It was impossible for arithmetic units, such as a computer, to have been required for coding/decryption, and it to have decrypted information simply for digital data, with the technique of (3). Moreover, since an arithmetic unit was the need, it was difficult to make it low cost.

[0011] Let it be a technical problem that this invention cancels the fault of the starting conventional technique, and enables it to reproduce it easily [distribute and record various information on plurality, and].

[0012]

[Means for Solving the Problem] It considers as the image generative system first characterized by providing a means to input the embedding-ed image which is an embedding image, a color picture, or a shade image as image data, a means to generate the share pattern which distributed the embedding image, and a means to embed a share pattern in an embedding-ed image, and to generate a share image at invention of claim 1 in order to attain the above-mentioned technical problem in this invention.

[0013] By moreover, the thing made equivalent [one or more auxiliary pixels] to a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 2, and each pixel of an embedding image By deleting the pixel of the embedding-ed image corresponding to a part for the specific color part of a means to generate the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern, and making it transparence A share pattern is embedded in an embedding-ed image, and it considers as the image generative system characterized by providing a means to generate a share image.

[0014] Moreover, a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 3, and to amend the gradation of an embedding image, By the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image By deleting the pixel of the embedding-ed image corresponding to a part for the specific color part of a means to generate the share pattern by which gradation amendment was carried out and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern, and making it transparence It considers as the image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[0015] By moreover, the thing made equivalent [one or more auxiliary pixels] to a means to input the

embedding-ed image which are an embedding image and a color picture as image data in invention of claim 4, and each pixel of an embedding image It transposes to a means to generate the share pattern which distributed the embedding image, and the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share pattern was set by arbitration. It considers as the image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[0016] Moreover, a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 5, and to amend the gradation of an embedding image, By the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image A means to generate the share pattern by which gradation amendment was carried out and which it embedded [pattern] and distributed the image, It transposes to the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share pattern was set by arbitration, and considers as the image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[0017] By moreover, the thing made equivalent [one or more auxiliary pixels] to a means to input the embedding-ed image which are an embedding image and a pattern image of a color as image data in invention of claim 6, and each pixel of an embedding image By moving a means to generate the share pattern which distributed the embedding image, and the pixel of an embedding-ed image, based on one or more auxiliary pixels to which a share pattern corresponds It considers as the image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[0018] Moreover, in invention of claim 7, it considers as the image generative system characterized by to provide a means generate the share pattern which distributed the embedding image by making one or more auxiliary pixels equivalent to a means input an embedding image as image data, and each pixel of an embedding image, and a means make a hole in the part corresponding to the auxiliary pixel of the specific color of a share pattern, and output a share to a medium.

[0019] Moreover, while making one or more auxiliary pixels equivalent to a means to input an embedding image as image data, a means to memorize additional information, and each pixel of an embedding image, in invention of claim 8, embedding and distributing an image, it considers as the image generative system characterized by providing a means to make also embed additional information using the redundancy which exists in the response, and to generate a share pattern.

[0020] By moreover, the thing made equivalent [one or more auxiliary pixels] to a means to input an embedding image as image data, a means to memorize additional information, and each pixel of an embedding image, in invention of claim 9 A means to generate the share pattern which distributed the embedding image, and a means to express additional information by the two-dimensional pattern, and to divide into the auxiliary pixel of the specific color of a share pattern, It considers as the image generative system characterized by providing a means to generate a share image, by superimposing the two-dimensional pattern expressing the divided additional information corresponding to each auxiliary pixel of the specific color of a share pattern.

[0021] Moreover, a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 10, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of a means to generate the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern was embedded, and making it transparence It considers as the image generative system characterized by providing a means to embed a share pattern in the embedding-ed

image with which the digital watermark was embedded, and to generate a share image.

[0022] Moreover, a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 11, and to amend the gradation of an embedding image, The digital watermark expressing additional information by the means embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of a means to generate the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern was embedded, and making it transparence It considers as the image generative system characterized by providing a means to embed a share pattern in the embedding-ed image with which the digital watermark was embedded, and to generate a share image.

[0023] Moreover, a means to input the embedding-ed image whose invention of claim 12 is an embedding image and a color picture as image data, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image It transposes to the color to which the pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was determined as a means to generate the share pattern which distributed the embedding image by arbitration. It considers as the image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[0024] Moreover, a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 13, and to amend the gradation of an embedding image, The digital watermark expressing additional information by the means embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image A means to generate the share pattern by which gradation amendment was carried out and which it embedded [pattern] and distributed the image, A means to transpose to the color to which the pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was set by arbitration, to embed a share pattern in an embedding-ed image, and to generate a share image, It considers as the image generative system characterized by providing.

[0025] Moreover, a means to input the embedding-ed image which are an embedding image and a pattern image of a color as image data in invention of claim 14, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image By moving the pixel of a means to generate the share pattern which distributed the embedding image, and the embedding-ed image which had the digital watermark embedded based on one or more auxiliary pixels to which a share pattern corresponds It considers as the image generative system characterized by providing a means to embed a share pattern in the embedding-ed image which had the digital watermark embedded, and to generate a share image.

[0026] Moreover, a means to input the embedding-ed image which are an embedding image and a shade image as image data in invention of claim 15, By making one or more auxiliary pixels equivalent to the means which carries out bottom raising of the number of pixels of the whole embedding-ed image, and each pixel of an embedding image A means to generate the share pattern which distributed the embedding image, and when it rasterizes an embedding image and a halftone dot is generated By embedding so that the include angle of a halftone dot may be set up according to the color of the auxiliary pixel of the share pattern corresponding to each halftone dot, and adjusting an

image It considers as the image generative system characterized by providing a means to embed a share pattern in an embedding image and to generate a share image, and a means to rasterize a share image.

[0027] Moreover, in invention of claim 16, it considers as claims 1-6 and the image generative system of 9-14 given in any 1 term which are characterized by providing a means to output a share.

[0028] Moreover, in invention of claim 17, it considers as the image generative system according to claim 8 characterized by providing a means to output a share, based on a share pattern.

[0029] Moreover, in invention of claim 18, it considers as the image generative system according to claim 15 characterized by providing a means to output a share, based on the rasterized share image.

[0030] Moreover, in invention of claim 19, it considers as claim 7 and the image generative system of 16-18 given in any 1 term which are characterized by providing a means to give the device which makes playback easy to a share.

[0031] Moreover, in invention of claim 20, the above-mentioned device considers as the image generative system given in claim 19 term characterized by being adding the mark for alignment to a share.

[0032] Moreover, in invention of claim 21, the above-mentioned device considers as the image generative system given in claim 19 term characterized by being applying adhesion material to one side of a share.

[0033] Moreover, in invention of claim 22, when the above-mentioned device outputs a share, it considers as the image generative system according to claim 19 characterized by being detaching spacing of pixels before that.

[0034] Moreover, in invention of claim 23, it considers as the image generation method characterized by including the process which inputs the embedding-ed image which is an embedding image, a color picture, or a shade image as image data, the process which generates the share pattern which distributed the embedding image, and the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0035] By the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 24, and moreover, making one or more auxiliary pixels equivalent to each pixel of an embedding image By deleting the pixel of the embedding-ed image corresponding to a part for the specific color part of the process which generates the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern, and making it transparence It considers as the image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0036] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 25, and amends the gradation of an embedding image, By the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image By deleting the pixel of the embedding-ed image corresponding to the specific color of the process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern, and making it transparence It considers as the image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0037] By the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 26, and moreover, making one or more auxiliary pixels equivalent to each pixel of an embedding image It transposes to the process which generates the share pattern which distributed the embedding image, and the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share pattern was set by arbitration. It considers as the image generation method characterized by including

the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0038] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 27, and amends the gradation of an embedding image, By the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image The process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, It transposes to the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share pattern was set by arbitration, and considers as the image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0039] By the process which inputs the embedding-ed image which are an embedding image and a pattern image of a color as image data in invention of claim 28, and moreover, making one or more auxiliary pixels equivalent to each pixel of an embedding image By the process which generates the share pattern which distributed the embedding image, and moving the pixel of an embedding-ed image based on one or more auxiliary pixels to which a share pattern corresponds It considers as the image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0040] Moreover, in invention of claim 29, it considers as the image generation method characterized by to include the process which generates the share pattern which distributed the embedding image by the process which inputs an embedding image as image data, and making one or more auxiliary pixels equivalent to each pixel of an embedding image, and the process which makes a hole in the part corresponding to the auxiliary pixel of the specific color of a share pattern, and outputs a share to a medium.

[0041] Moreover, while making one or more auxiliary pixels equivalent to the process which inputs an embedding image as image data, the process which memorizes additional information, and each pixel of an embedding image in invention of claim 30, embedding and distributing an image, it considers as the image generation method characterized by including the process which is made to also embed additional information using the redundancy which exists in the response, and generates a share pattern.

[0042] By invention of claim 31, by the process which inputs an embedding image as image data, the process which memorizes additional information, and moreover, making one or more auxiliary pixels equivalent to each pixel of an embedding image The process which generates the share pattern which distributed the embedding image, and the process which expresses additional information by the two-dimensional pattern, and is divided into the auxiliary pixel of the specific color of a share pattern, It considers as the image generation method characterized by things including the process which generates a share image by superimposing the two-dimensional pattern expressing the divided additional information corresponding to each auxiliary pixel of the specific color of a share pattern.

[0043] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 32, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of the process which generates the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern was embedded, and making it transparence It considers as the image generation method characterized by including the process which embeds a share pattern in the embedding-ed image with which the digital watermark was embedded, and generates a share image.

[0044] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 33, and amends the gradation of an embedding

image, The digital watermark expressing additional information by the means embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of the process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern was embedded, and making it transparence It considers as the image generation method characterized by including the process which embeds a share pattern in the embedding-ed image with which the digital watermark was embedded, and generates a share image.

[0045] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 34, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image It transposes to the color to which the pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was determined as the process which generates the share pattern which distributed the embedding image by arbitration. It considers as the image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0046] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 35, and amends the gradation of an embedding image, The digital watermark expressing additional information by the process embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image The process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, The process which transposes to the color to which the pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was set by arbitration, embeds a share pattern in an embedding-ed image, and generates a share image, ***** -- it considers as the image generation method characterized by things.

[0047] Moreover, the process which inputs the embedding-ed image which are an embedding image and a pattern image of a color as image data in invention of claim 36, By the process which embeds the digital watermark expressing additional information in an embedding-ed image, and making one or more auxiliary pixels equivalent to each pixel of an embedding image By the process which generates the share pattern which distributed the embedding image, and moving the pixel of the embedding-ed image which had the digital watermark embedded based on one or more auxiliary pixels to which a share pattern corresponds It considers as the image generation method characterized by including the process which embeds a share pattern in the embedding-ed image which had the digital watermark embedded, and generates a share image.

[0048] Moreover, the process which inputs the embedding-ed image which are an embedding image and a shade image as image data in invention of claim 37, By the process which carries out bottom raising of the number of pixels of the whole embedding-ed image, and making one or more auxiliary pixels equivalent to each pixel of an embedding image The process which generates the share pattern which distributed the embedding image, and when it rasterizes an embedding image and a halftone dot is generated By embedding so that the include angle of a halftone dot may be set up according to the color of the auxiliary pixel of the share pattern corresponding to each halftone dot, and adjusting an image It considers as the image generation method characterized by including the process which embeds a share pattern in an embedding image and generates a share image, and the process which rasterizes a share image.

[0049] Moreover, in invention of claim 38, it considers as claims 23-28 and the image generation method of 31-36 given in any 1 term which are characterized by including the process which outputs a share based on a share image.

[0050] Moreover, the image generation method according to claim 30 characterized by including the process which outputs a share in invention of claim 39 based on a share pattern.

[0051] Moreover, in invention of claim 40, it considers as the image generation method according to claim 37 characterized by including the process which outputs a share based on the rasterized share image.

[0052] Moreover, in invention of claim 41, it considers as claim 29 and the image generation method of 38-40 given in any 1 term which are characterized by including the process which gives the device which makes playback easy to a share.

[0053] Moreover, in invention of claim 42, the above-mentioned device considers as the image generation method given in claim 41 term characterized by being adding the mark for alignment to a share.

[0054] Moreover, in invention of claim 43, the above-mentioned device considers as the image generation method according to claim 41 characterized by being applying adhesion material to one side of a share.

[0055] Moreover, in invention of claim 44, when the above-mentioned device outputs a share, it considers as the image generation method according to claim 41 characterized by being detaching spacing of pixels before that.

[0056] Moreover, in invention of claim 45, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets on which the color or the shade image is recorded, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[0057] Moreover, in invention of claim 46, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets on which the pattern image of a color is recorded, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[0058] Moreover, in invention of claim 47, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets which the hole is opening, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[0059] Moreover, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets as which the additional information which is not in sight by arrangement of each pixel with the naked eye is expressed, only for an image appearing, recording an image, embedding in invention of claim 48 even if it piles up the share of less than k sheets, and an image not appearing.

[0060] Moreover, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets to which the share of the image of a color with which the digital watermark expressing additional information is embedded in invention of claim 49 is carried out, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[0061] Moreover, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets on which the pattern image of a color with which the digital watermark expressing additional information is embedded in invention of claim 50 is recorded, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[0062] Moreover, it considers as the record object characterized by embedding even if it will embed

when moire occurs, and an image will appear and it will pile up the share of less than k sheets, if the share of k or more sheets is piled up in invention of claim 51 among the shares of n sheets on which the shade image is recorded, and an image not appearing.

[0063] Moreover, in invention of claim 52, it considers as the record object of claim 45-51 characterized by having given the device which makes playback easy to a share given in any 1 term.

[0064] Moreover, in invention of claim 53, the above-mentioned device considers as the record object according to claim 52 characterized by being having added the mark for alignment to the share.

[0065] Moreover, in invention of claim 54, the above-mentioned device considers as the record object according to claim 52 characterized by being having applied adhesion material to one side of a share.

[0066] Moreover, in invention of claim 55, the above-mentioned device considers as the record object according to claim 52 characterized by being that spacing of the pixels on which the share is recorded is separated.

[0067]

[Embodiment of the Invention] (Operation gestalt common on the whole) The whole concerning the image generative system of claim 1, the image generation method of claim 23, and the record object of claim 45 explains a common operation gestalt first.

[0068] The physical configuration of the image generative system applied to this operation gestalt at drawing 1 is shown. This image generative system consists of CPU101, an image memory 102, the image input section 103, program memory 104, and the image recording section 105, and these are all connected by the bus 106. The image-processing section 107 is constituted by CPU101, an image memory 102, the image input section 103, and program memory 104.

[0069] If actuation of this image generative system is explained briefly, it will embed through the image input section 103 first, and an image and an embedding-ed image will be written in the predetermined field of an image memory 102, respectively. And based on the algorithm shown below, computation is given to these images, a share image is created, and a share is outputted by recording this share image on a record medium in the image recording section 105, or recording in forms, such as printing.

[0070] All of these the processings of a series of are performed by CPU according to the program stored in program memory 104. In addition, although the equipment of dedication may be used for processing, general-purpose computers, such as a personal computer, may be used. In this case, as for an image memory 102 and program memory 104, it is common to divide a field and to use the same memory.

[0071] The mimetic diagram of the flow of these processings is shown in drawing 19 . A share image is generated by an embedding image being first disassembled into a share pattern, and superimposing a share pattern on an embedding-ed image by drawing 19 . And a share is generated with outputting a share image as a record object.

[0072] Next, the configuration of the embedding image which is an input image of this system, and an embedding-ed image, and the content and semantics of an image processing are explained to a detail.

[0073] An input image is usually expressed the same with being used for an expression by the calculating machine as digital information as which concentration was defined on each lattice point of a rectangular coordinate system. Here, biaxial [of a rectangular coordinate system] is made into a x axis and the y-axis, and it is expressed as width and length for convenience, respectively.

[0074] You may be a color picture although a gray scale image and a monochrome binary image are fundamentally used as an embedding image with this operation gestalt. The concentration value of a pixel (x y) is expressed as P (x y). In the case of a monochrome binary image, the pixel at P(x y) = 1 with a black and white pixel is set to P(x y) = 0. To a share pattern, it embeds like drawing 2 , and one or more auxiliary pixels exist in it to 1 pixel of an image. In the example of drawing 2 , four auxiliary

pixels correspond to 1 pixel. This auxiliary pixel is a monochrome binary image, and expresses the auxiliary pixel corresponding to the embedding image $P(x, y)$ as $Q(x, y, r)$. Here, r is one or more integers by the auxiliary pixel number. Moreover, a color picture and a gray scale image are used for an embedding-ed image.

[0075] However, more generally with this operation gestalt, it can extend to a binary image and a shade image. A binary image means that the pair of the black in a monochrome binary image and white may be changed into the combination of two colors, such as blue, white, red and white, blue, and yellow. In this case, upper $P(x, y)$ will mean the pixel of the 1st color at the time of $P(x, y) = 1$, and the pixel of the 2nd color will be meant at the time of $P(x, y) = 0$. For example, when using the pair of blue and yellow, $P(x, y) = 1$ means a blue pixel, and $P(x, y) = 0$ means a yellow pixel.

[0076] Similarly, by the shade image, the concentration value of the 1st color in a pixel (x, y) is expressed by $P(x, y)$, and the concentration value of the 2nd color in a pixel (x, y) is expressed by $1 - P(x, y)$. For example, when using the pair of blue and yellow instead of the pair of white and black, $P(x, y)$ expresses the concentration value of the blue in a pixel (x, y) , and $1 - P(x, y)$ expresses the concentration value of the yellow in a pixel (x, y) . This shade image is the gentle escape of a gray scale image. It is because it is thought that it is possible that $P(x, y)$ expresses the concentration value of the black in a pixel (x, y) with a gray scale image, and another side $1 - P(x, y)$ expresses the concentration value of the white in a pixel (x, y) .

[0077] When using a binary image and a shade image, an auxiliary pixel becomes the binary image which consists of two colors. For example, in the case of the shade image which consists of the binary image or two colors which consist of two colors using the pair of blue and yellow, it becomes the binary image with which an auxiliary pixel also consists of a pair of blue and yellow.

[0078] Although it describes on these descriptions below when mainly using a monochrome binary image or a gray scale image since it is simple, more, generally, a monochrome binary image can be extended to a binary image, and a gray scale image can be extended to a shade image.

[0079] Next, the algorithm of the image processing in this operation gestalt is explained according to the flow chart of drawing 3.

[0080] 1st step (S1); -- the ON of an embedding image and an embedding-ed image -- it is not strained but an embedding image and an embedding-ed image are inputted as digital data. When the image already serves as digital data, it changes into a graphics format suitable as it is. In the case of hard copy, a film photo, etc., an image reads with a digital scanner, and inputs them as digital data.

[0081] The 2nd step (S2); based on generation, next the embedding image of a share pattern, for example, a vision decode mold secrecy variational method is used, and a share pattern is generated. It is possible to reproduce an embedding image with the combination of a share pattern. Moreover, it is also possible to make an embedding image into two or more sheets by recombination of the pair of a share pattern. In generation of a share pattern, a random number is generated first. Pseudo-random numbers, such as an M sequence, are used as a generating means of a random number. And combination of a share pattern is chosen according to the random number. Since the selection approach of combination changes with each operation gestalten, explanation of each operation gestalt describes it.

[0082] The 3rd step (S2); a share pattern is embedded in superposition processing of an image, next an embedding-ed image, and a final share image is generated. This superposition processing changes with each operation gestalten, and explanation of each operation gestalt describes it.

[0083] The 4th step (S3); at amendment processing of a share image, next the 4th step, the share image expressed of the color component of RGB is changed into the amount signal of ink used in order to print as an amount of ink of four colors of YMCK in the image recording section. This conversion is conventionally known widely as a color conversion technique. In addition, if it

processes with the YMCK base from the beginning, processing of the 4th step can be excluded. Moreover, this processing is unnecessary, when making a hole in the medium instead of the amount signal of ink and recording a share image on it.

[0084] Although software processing realized a series of share image generation processings in the above explanation, realizing by hardware is also possible. Drawing 4 is the configuration of the image generative system which realizes a series of share image generation mentioned above by hardware.

[0085] Two image memories which store an embedding image and an embedding-ed image, the share pattern generating section which generates a share pattern, the image superposition section which superimposes an image, the amendment processing section which performs amendment processing of a share image, and the image recording section which records an image are put together, and an image generative system is constituted.

[0086] First, an embedding image is digital-data-ized and is stored in an image memory 1. Similarly, an embedding-ed image is also digital-data-ized and is stored in an image memory 2. Next, in the share pattern generating section, a random number is generated and a share pattern is generated according to a random number based on the embedding image data inputted from an image memory 1. The generation method of a share pattern changes with each operation gestalten, and is described in detail explanation of each operation gestalt. In the image superposition section, the share pattern generating section to a share pattern is inputted, an image memory 2 to an embedding-ed image superimposes these images, and a share image is generated. And next, a share image flows in the image amendment section, and RGB data are changed into the data of YMCK. Finally, a share image outputs a share by being recorded on a medium with gestalten, such as hard copy, in the image recording section.

[0087] Thus, it is possible to realize the aforementioned image processing easily also by hardware. If hardware is used, it is possible to perform an image processing at a high speed, and it is effective when especially the share of a large quantity needs to be generated.

[0088] Next, the regenerative apparatus which reproduces an embedding image is concretely explained from the share recorded through the share image as mentioned above.

[0089] Drawing 5 is drawing having shown the example of 1 configuration of a regenerative apparatus. A regenerative apparatus is loaded with a share and it fixes. Thereby, shares are fixed to position relation. By observing this fixed share, it embeds from a share, an image is compounded and it can recognize. Moreover, it is possible to make playback clearer by arranging the light source of an electric bulb etc. in the lower part of a regenerative apparatus. In addition, as long as a regenerative apparatus can fix the physical relationship of not only a configuration as shown in drawing 5 but a share, what kind of structure is sufficient as it.

[0090] Next, an easy example is taken and the principle which is embedded with a regenerative apparatus and by which an image is reproduced is explained. As an example, the case where use a monochrome binary image as an embedding image, and a plain image is used as an embedding-ed image is described.

[0091] When the share image recorded at the time of playback is piled up, it looks visually in the form where embedded into the embedding-ed image and the image lapped. In the case of this example, the generated share image also turns into a monochrome binary image. And according to the lap condition of the shares of each pixel, the pixel looks white to human being's eyes like drawing 6 , or it sees black. Therefore, about the black pixel of an embedding image, it becomes possible by constituting a share pattern so that it may look black at the time of playback, and constituting a share pattern so that it may look white about the white pixel of an embedding image at the time of playback to reproduce an embedding image by human being's eyes. It becomes important to take the sufficiently large contrast ratio of two parts so that a black part and a white part can be easily distinguished to human

being's eyes at this time. In addition, although the pair of black and white explained in this example, it is possible to acquire the same effectiveness also in combination, such as the combination of other colors, for example, blue, white, red and white, blue, and yellow. Henceforth the pair of black and white explains fundamentally, and the combination of other colors is also possible.

[0092] In addition, it is possible to make it make alignment at the time of playback easy by adding the mark for alignment as shown in a medium at drawing 7 as a device make it easy to reproduce, a location not shift simply, etc., once piling up by applying weak adhesion material to one side of a share. Moreover, as shown in drawing 8, the device make effect by blurring etc. hard to be influenced is also effective as a thing which make it easy to reproduce by detaching a pixel and arranging what connected and arranged pixels conventionally.

[0093] From a degree, concrete processing is shown according to each operation gestalt.

[0094] (1st operation gestalt) The 1st [concerning the image generative system of claims 2-5 and the image generation method of claims 24-27] operation gestalt is explained first. With this operation gestalt, a gray scale image is used as an embedding image. And a color picture is used for an embedding-ed image. With this operation gestalt, since a color picture is used as an embedding-ed image, in the example of drawing 6, at the time of playback, a color will take lessons from the black part of drawing 6, and the colorless or same color will attach a white part. Visually, the part of the colorless or same color becomes possible [other parts being distinguished, and it being recognized and recognizing an embedding image].

[0095] Next, the algorithm of the image processing in this operation gestalt is explained to a detail along with the flow chart of drawing 3.

[0096] The 1st step (S1); (input of an embedding image and an embedding-ed image)

An embedding image and an embedding-ed image are inputted as digital data. With this operation gestalt, an embedding image is inputted as a color picture as an embedding-ed image as a gray scale image. An embedding image is disassembled into an auxiliary pixel at the same time it is inputted. Generally, the number of pixels of an auxiliary pixel increases as gradation becomes fine. Although it is possible to express a smoother image by making [many] the number of gradation, when the number of auxiliary pixels increases, the magnitude of an auxiliary pixel becomes small and the alignment at the time of playback becomes difficult. Therefore, the number of gradation is made few to extent to which the quality of an image is not lowered, and it becomes important to maintain the magnitude and balance of an auxiliary pixel. Approaches, such as a "error diffusion method", are learned as preparation of gradation.

[0097] The 2nd step (S2); based on the embedding image which generated next amended [gradation] the share pattern, for example, a vision decode mold secrecy variational method is used, and a share pattern is generated. The combination of a share pattern enables it to reproduce an embedding image. Moreover, it is also possible to make an embedding image into two or more sheets by recombination of the pair of a share pattern. In generation of a share pattern, a random number is generated first. And combination of a share pattern is chosen according to the random number. The thing of the combination of a share pattern will be called a "set" after this. Like the example of drawing 9, when there are four sets of combination of a share pattern, a set is chosen from 1 according to the random number which was made to generate the random number of 4 and was generated. Like drawing 9, if two patterns are contained in one set, an embedding image will be distributed by the share pattern of two sheets. Selection of a set is chosen from a white set when the pixel of a corresponding embedding image is white, and when a pixel is black, it is chosen from a black set. This is performed about each pixel and a share pattern is generated about the whole screen. In this operation gestalt, an embedding image is a gray scale image by which gradation amendment was carried out, and the number of auxiliary pixels is determined according to the number of gradation. It is white and black, the example

of drawing 9 is the case where the number of gradation is 2, and the number of sets also increases it as the number of gradation increases. An embedding image is distributed by two or more share patterns in this step.

[0098] The 3rd step (S3); in superposition processing of an image, next superposition processing of an image, a share pattern is embedded in an embedding-ed image, and a final share image is generated. Embedding is performed by leaving the pixel of the embedding-ed image corresponding to the black part of each auxiliary pixel of a share pattern, deleting the pixel corresponding to the white part of each auxiliary pixel of a share pattern, and making it transparence. If it is made for an embedding image to remain more at this time, the appearance of a final share will become good. For the reason, appearance will become good, if a share pattern is devised so that as black a part as possible may increase a pattern in the 2nd step. Moreover, if a certain specific color is applied instead of the pixel corresponding to the white part of a share pattern, it will embed instead of the appearance of a share being spoiled somewhat, and an image will be reproduced more vividly.

[0099] The 4th step (S4); in amendment processing of a share image, next the 4th step, the share image expressed of the color component of RGB is changed into the amount of ink of four colors of YMCK in the image recording section.

[0100] The above is a series of image processings in this operation gestalt, and outputs a share after this processing by recording a share image as record objects, such as hard copy, according to the amount signal of ink in the image recording section.

[0101] Playback is performed by using the regenerative apparatus of drawing 5 or doubling each share by people's hand.

[0102] (2nd operation gestalt) Next, the 2nd [concerning the image generative system of claim 6 the image generation method of claim 28, and the record object of claim 46] operation gestalt is explained. With this operation gestalt, the pattern image which put an image and an alphabetic character small as an embedding-ed image in order is used.

[0103] With this operation gestalt, as an embedding image, a monochrome binary image is used and the pattern image which put a small image and a small alphabetic character in order as an embedding-ed image is used. Since a pattern image had the low redundancy of an image, it was difficult for it to embed by the approach of the 1st operation gestalt and to reproduce an image vividly. The thing of a small image or an alphabetic character will be called a small pattern after this.

[0104] The property of the share image recorded with this operation gestalt is explained. The generated share image is a pattern image which put a small image and a small alphabetic character in order, according to the lap condition of each smallness pattern of shares, is different to human being's eyes like [in the case of the LOGO of drawing 10], and is observed. When a small pattern is put together exactly, the part looks whitish, and the part looks blackish when a small pattern shifted and is put together. As there is a pattern exactly about the white part of an embedding image, an embedding image can be observed with constituting a black part so that a pattern may shift.

[0105] Next, the algorithm of the image processing in this operation gestalt is explained to a detail according to the flow chart of drawing 3 .

[0106] The 1st step (S1); an embedding image, the input embedding image of an embedding-ed image, and an embedding-ed image are inputted as digital data. In this operation gestalt, an embedding image is inputted as a monochrome binary image, and a small pattern is actually inputted as a color picture as an embedding-ed image. An embedding-ed image carries out the average poor thing of this small pattern in all directions, and is interpreted.

[0107] The 2nd step (S2); a share pattern is generated based on an embedding image like the operation gestalt of the generation 1st of a share pattern. In the example in the case of the LOGO of drawing 10 , the number of auxiliary pixels is one to each pixel of an embedding image, and a share pattern is

expressed by two kinds of right justification Rika left [LOGO]. Therefore, a share pattern is expressed with binary [of the black showing rightist inclinations, and the white showing the left]. Of course, a LOGO is able for the top left, top rightist inclinations, the bottom left, and bottom rightist inclinations to prepare four kinds, and to set the number of auxiliary pixels to two according to it. [0108] The 3rd step (S3); a small pattern is arranged according to superposition processing of an image, next a share pattern, and a final share image is generated. That is, when there are N sets of combination of a share pattern, according to a share pattern, the combination of one set of the N sets is written in each share. This is performed to each pixel, it processes to all image screens, and a share image is generated. In the case of the LOGO of drawing 10 , a share pattern is two sets of the black showing rightist inclinations, and the white showing the left. A share pattern arranges a small pattern into a black part at rightist inclinations, and a share pattern arranges a small pattern into a white part at the left.

[0109] The 4th step (S4); RGB data are changed into the amount of ink of YMCK like the operation gestalt of the amendment processing 1st of a share image.

[0110] The above is a series of image processings in this operation gestalt, and outputs a share after this processing by recording a share image as record objects, such as hard copy, in the image recording section like the 1st operation gestalt.

[0111] The playback approach is performed like the 1st operation gestalt.

[0112] (3rd operation gestalt) Next, the 3rd [concerning the image generative system of claim 7 the image generation method of claim 29, and the record object of claim 47] operation gestalt is explained. With this operation gestalt, a hole is made in the **** stiffness which records a share image as hard copy at a medium.

[0113] With this operation gestalt, as an embedding image, a monochrome binary image is used and an embedding-ed image is not used. However, it is possible to improve appearance by printing the image of arbitration on the medium which makes a hole. Moreover, although it is possible to also use a gray scale image as an embedding image, from the number of auxiliary pixels increasing, the magnitude of an auxiliary pixel becomes small, it becomes difficult to maintain the reinforcement when making a hole, or problems, like it becomes difficult to double a share at the time of playback come out. Although the sheet mainly transparent as a medium was used with the operation gestalt to the above-mentioned, in the case of this operation gestalt, it is possible to use an opaque thing.

[0114] The share by which generation record was carried out from the share pattern with this operation gestalt meets a pattern, and the hole is made. A pattern is observed by human being's eyes according to the lap condition of the hole of each pattern of shares. When a pattern is put together exactly, a hole opens, the part is visible, and when a pattern shifted and is put together, the part is visible where a hole is closed. An embedding image can be observed with constituting a black part so that a pattern may shift so that a pattern may suit the white part of an embedding image exactly.

[0115] Next, the algorithm of the image processing in this operation gestalt is explained to a detail along with the flow chart of drawing 11 .

[0116] The 1st step (S1); the input embedding image of an embedding image is read. An embedding image is inputted as a monochrome binary image. An embedding-ed image is not used with this operation gestalt.

[0117] The 2nd step (S2); like the operation gestalt of the generation 1st of a share pattern, based on an embedding image, for example, a vision decode mold secrecy variational method is used, and a share pattern is generated.

[0118] In this operation gestalt, the 3rd step (superposition processing of an image) and the 4th step (amendment processing of a share image) are unnecessary.

[0119] The above is a series of image processings in this operation gestalt, and outputs a share after

this processing by making and recording a hole on a medium according to a share pattern in the image recording section.

[0120] Next, how to make a hole in a medium is explained. Either the black of a share pattern or a white pattern is chosen, and the hole of the suitable magnitude for the pattern part is made. As shown in the medium 1 which made the hole of drawing 12, when making a hole, a frame is given and a hole is made. When a hole is made to the limit of the magnitude of the pixel of a pattern, in the case of a pattern which is in the medium 2 which made the hole of drawing 12, this is because the black pixel of middle falls out, without preparing a frame. Moreover, if it leaves the part of an angle as shown in the medium 3 which made the hole of drawing 12, the reinforcement of a frame can fully be maintained. The equipment which makes a hole in a medium can also generate a fine hole by making a hole by the puncher or using an etching technique.

[0121] Also in this operation gestalt, it embeds by the same approach as the 1st operation gestalt, and information is reproduced.

[0122] Although it was only the technique by the hard copy to a medium conventionally, this operation gestalt enabled it to be adapted also for an opaque medium, and it became possible to extend the application range.

[0123] (4th operation gestalt) Next, the image generative system of claims 8-14, the image generation method of claims 30-36, and the 4th [concerning claims 48-50] operation gestalt are explained. This approach makes it possible to embed into a share pattern and to embed the digital information of arbitration in addition to the information about an image. The digital information embedded apart from the information about an embedding image will be called "additional information" after this.

[0124] This operation gestalt can roughly be classified into two kinds. It is two although additional information is embedded as a digital watermark with what embeds additional information as a monochrome two dimensional code. Although an auxiliary pixel is further divided with the thing using a still more redundant share pattern and a two dimensional code is embedded when embedding additional information as a two dimensional code, there are two kinds.

[0125] (When embedding 4-a additional information as a two dimensional code) When embedding additional information as a monochrome two dimensional code, a monochrome binary image is used as an embedding image, and an embedding-ed image is not used. In this case, although not a monochrome binary image but the image of arbitration can also be used for an embedding image, playback of the additional information by equipment becomes difficult.

[0126] First, the algorithm of the image processing in the case of using a redundant share pattern is explained to a detail along with the flow chart of drawing 13.

[0127] The 1st step (S1); the input embedding image of an embedding image is inputted. An embedding image is read. An embedding image is inputted as a monochrome binary image. An embedding-ed image is not used with this operation gestalt. On the other hand, it digitizes about additional information and records on memory apart from the image.

[0128] 2nd step (S2); -- generation of a share pattern, and superposition processing of an image -- when using a redundant share pattern, generation of a share pattern and superposition processing of an image are performed simultaneously. That is, a share pattern serves as a share image final as it is. Generation of the share pattern using a vision decode mold secrecy variational method is performed in two steps, pretreatment of additional information, and selection of a set. However, when using a redundant share pattern, a set will call [those with two kind, and] it a "set" and a "small set", respectively. The number of sets of drawing 14 is an example in case 3 and the small number of sets are 2. Although constituted from the 1st operation gestalt only using one set of the set of this operation gestalt, it is possible to embed additional information by preparing the number of sets for three redundancy with this operation gestalt. First, with pretreatment of additional information,

information is changed according to the redundancy of a share pattern. In the example of drawing 14 , the number of sets is 3 and can distinguish three kinds per pixel. Although, as for digital information, the base is generally recorded by 2, the base changes additional information into the data of 3 in this case. Next, superposition in additional information is performed to the selection and coincidence of a small set by the random number. The set number chosen from the pretreated additional information is acquired, and the small set in a set is chosen by generating a random number. The share pattern of each pixel is determined as a meaning by this. A series of processings to each of this pixel are performed about all pixels.

[0129] In this operation gestalt, a share image is a monochrome binary image and image transformation processing like the 4th step (amendment processing of a share image) of the 1st operation gestalt is unnecessary.

[0130] The above is a series of image processings in this operation gestalt, and outputs a share after this processing by recording a share image as record objects, such as hard copy, in the image recording section like the 1st operation gestalt.

[0131] next, the algorithm of the image processing in the case of dividing an auxiliary pixel further is boiled and explained according to the flow chart of drawing 15 . The difference with the case where a redundant share pattern is used is in the 2nd step and the 3rd step.

[0132] 1st step (S1); -- the input of an embedding image -- like the case where a redundant share pattern is used, an embedding image is inputted as a monochrome binary image, and an embedding-ed image is not used.

[0133] The 2nd step (S2); based on generation, next the embedding image of a share pattern, a vision decode mold secrecy variational method is used, and a share pattern is generated. A random number is generated like the 1st operation gestalt, and a set is chosen. Unlike the case where a redundant share pattern is used, a share pattern is generated, without dividing a set and a small set. And apart from generation of a share pattern, information is used as the two-dimensional pattern of white and black by making additional information into a two dimensional code. And this two-dimensional pattern is divided into the black number of auxiliary pixels of a share pattern.

[0134] The 3rd step (S3); in superposition processing of an image, next (superposition processing of an image) of the 3rd step, the share pattern generated at the 2nd step and a share pattern superimpose the two-dimensional pattern of the additional information generated independently, and generate a final share image. A share image is generated by specifically embedding the two-dimensional pattern divided into the black number of auxiliary pixels of a share pattern in the 2nd step into the black part of the auxiliary pixel of a share pattern. Drawing 16 expresses signs that additional information is added to the black part of each auxiliary pixel.

[0135] As well as the 1st operation gestalt when dividing an auxiliary pixel further, image transformation processing [like / the 4th step (amendment processing of a share image) of the 1st operation gestalt] is unnecessary, and outputs a share to recording a share image as record objects, such as hard copy, more in the image recording section after a series of image processings.

[0136] (When embedding 4-b additional information as a digital watermark) When embedding additional information as a digital watermark, a color picture is used for an embedding-ed image, using a gray scale image as an embedding image.

[0137] Although the algorithm of the image processing in this operation gestalt is the same as the approach fundamentally stated with the 1st operation gestalt or the 2nd operation gestalt, the points which embed a digital watermark in an embedding-ed image simultaneously at the time of the input of an embedding-ed image differ.

[0138] As an approach of putting in a digital watermark, the approach of of a "pixel space utilization mold", a "frequency-domain utilization mold", a "statistic utilization mold", etc., etc. is learned, and it

is stated to reference (3).

[0139] Playback of the recorded information is also the same as when [also when embedding additional information as a two dimensional code] embedding as a digital watermark. Playback is divided into the part reproduced by people's eyes like the 1st operation gestalt, and the playback part of the additional information using a regenerative apparatus. Playback by human being's eyes is performed because shares pile up, and playback of additional information is performed using a regenerative apparatus.

[0140] The regenerative apparatus of additional information consists of the output section, as a result of displaying the image input section which reads a share, the image-processing section which processes the inputted result, and the processed result, as shown in drawing 17 .

[0141] The image input section can use a bar code scanner, a flat bed mold scanner, a drum-type scanner, etc. If a bar code scanner is used, inputting easily is possible and it is possible to constitute a regenerative apparatus comparatively cheaply. In the image-processing section, a response with the information which corresponds the inputted image with a share pattern is taken, and additional information is decoded. And in the result output section, a result is outputted by the display on a display, printing by the printer, etc.

[0142] Although the approach which can be conventionally reproduced by people's eyes to embed information, and the approach of using equipments, such as a digital watermark, to embed information were not able to be united, it is possible to unite both advantage well with this operation gestalt.

[0143] (5th operation gestalt) Next, the 5th [concerning the image generative system of claim 15 the image generation method of claim 37, and the record object of claim 51] operation gestalt is explained. Although it embedded according to the lap condition of the color of shares and the image was reproduced with the old operation gestalt, with this operation gestalt, it is not a lap of a color, and it embeds according to the lap condition of a halftone dot, and an image is reproduced. a moire phenomenon cuts a halftone dot image with the include angle as known well conventionally. A lifting and an embedding image are reproduced for a moire phenomenon by adjusting the pattern of the include angle of a halftone dot.

[0144] With this operation gestalt, a monochrome binary image is used as an embedding image. Moreover, a gray scale image is used for an embedding-ed image. Although it is also possible to use a gray scale image as an embedding image, it is difficult to reproduce vividly.

[0145] Next, the algorithm of the image processing in this operation gestalt is explained to a detail along with the flow chart shown in drawing 3 .

[0146] The 1st step (S1); the input of an embedding image, the input embedding image of an embedding-ed image, and an embedding-ed image is performed. With this operation gestalt, an embedding image is inputted as a gray scale image as a monochrome binary image and an embedding-ed image. An embedding-ed image performs processing to which an image becomes dark on the whole after an input. When an image is halftone-dot-ized in processing after this, this is because a clear moire phenomenon cannot be caused, if there is not sufficient pixel value. When bottom raising of a pixel value is carried out as a whole and shares are piled up so that contrast of an image may not be spoiled if possible, it adjusts so that the moire phenomenon which can fully be checked by people's eyes can be caused.

[0147] The 2nd step (S2); based on generation, next the embedding image of a share pattern, for example, a vision decode mold secrecy variational method is used, and a share pattern is generated. The set of a share pattern is divided into the set which starts moire when a share is piled up, and the set which does not start moire, and expresses each by the black pixel as a share pattern, and the white pixel. Moreover, it is also possible to carry out a richer expression with the reinforcement of moire by the increase of the number of sets or carrying out and increasing the number of auxiliary pixels of a

share pattern according to it.

[0148] The 3rd step (S3); superposition processing of an image, next superposition processing of a share pattern and an embedding-ed image are performed. Actually, the include angle of a halftone dot is changed according to a share pattern, and the consistency of a halftone dot is adjusted with the concentration value of an embedding-ed image. For example, a share pattern sets a black part as the include angle 0 of a halftone dot, and sets a white part as 45 include angles of a halftone dot. When shares are piled up, a moire phenomenon is not generated when the include angle of a halftone dot is the same but the include angles of a halftone dot differ so that it may illustrate to drawing 18, a moire phenomenon occurs, and an embedding image can be recognized. In addition, if the consistency of a halftone dot is too small, since sufficient moire will not occur but playback will become difficult, it is necessary to carry out image restoration so that consistency sufficient at the 3rd step may be secured.

[0149] amendment **** of a 4th step (S4); share image -- at this step, it changes into the raster data for outputting a halftone dot image based on the image created in the 3rd step. Conversion to raster data is performed by processing called rasterizing [which halftone-dot-izes an image].

[0150] The above is a series of image processings in this operation gestalt, and generates a share with outputting to a medium in the image recording section after this processing. As an output unit, there are film output machines, halftone dot printers, etc., such as an imagesetter.

[0151] Also in this operation gestalt, it embeds by the same approach as the 1st operation gestalt, and information is reproduced.

[0152] With the conventional technique, although it was difficult for a copy to generate a difficult share with a copy machine etc., it became possible by using a halftone dot like this operation gestalt to carry out easy reproduction in a copy machine etc. by the ability not doing.

[0153]

[Effect of the Invention] According to this invention, the share using the pattern image which put the image and the small image of the conventionally impossible arbitration in order can be created now, and power of expression became rich. Moreover, not only a transparent sheet but an opaque thing can be used now as a medium. Moreover, it became possible to embed additional information, without barring playback of a share. And by using a halftone dot, the copy with a copy machine became difficult, and the forged prevention effectiveness increased, and more good-looking playback was attained.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention can be used suitable to conceal by distributing the image especially about the technique of concealing an image including information recording. In addition, On these descriptions, the record object obtained based on a "share image", and a call, and a "share image" in the image which embedded a "share pattern", and a call, and a "share pattern" for two or more images which distributed the "embedding-ed image" and a call, and a "embedding image" for the image with which a "embedding image", a call, and information be embedded in an image including information to record in an "embedding-ed image" will call a "share". Furthermore, the meeting of a "share image group", a call, and a "share" is called [the meeting of a "share pattern"] a "share group" for the meeting of a "share pattern group", a call, and a "share image." Moreover, it shall express, saying the actuation an embedding image is made to be in sight of human being "is reproduced."

[Translation done.]

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PRIOR ART

[Description of the Prior Art] Conventionally, the reference which indicated it for the technique of concealing the image expressing information is mentioned, and it explains below.


[0003] (1) Kato **** Imai [Hideki]: -- "escape configuration method of vision decode mold secrecy variational method":Institute of Electronics, Information and Communication Engineers paper magazine A Vol.J79-A No.8 pp.1344-1351 -- a significant image will be reproduced, if this technique forms the random image of black and white of two or more sheets and these are piled up It is the technique of the ability to distribute secrecy not only combining the image of two sheets but combining the image of three or more sheets. If secrecy is distributed in two or more images, even if only one in two or more images comes to hand, it is impossible to get to know the information about other images entirely. Therefore, only what can obtain two or more sheets simultaneously can reproduce information, and becomes possible [carrying out distributed preservation of the secrecy] at insurance.

[0004] (2) An additional image is reproduced by the technique of *****9-248935***** by superimposing and recording another additional image on a certain main image, and piling up the image and pattern image. It has in the description that information is recordable into a color picture in the form which cannot be easily perceived by human being.

[0005] (3) Kineo Matsui: -- the "digital watermark":Institute of Image Electronics Engineers of Japan -- volume [26th] No. 3 (1997)

This technique reads a digital watermark by putting in and recording a digital watermark on digital data, and performing predetermined decode processing. As an approach of putting a digital watermark especially into a static image, the approach of of a "pixel space utilization mold", a "frequency-domain utilization mold", a "statistic utilization mold", etc., etc. is learned.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, the share using the pattern image which put the image and the small image of the conventionally impossible arbitration in order can be created now, and power of expression became rich. Moreover, not only a transparent sheet but an opaque thing can be used now as a medium. Moreover, it became possible to embed additional information, without barring playback of a share. And by using a halftone dot, the copy with a copy machine became difficult, and the forged prevention effectiveness increased, and more good-looking playback was attained.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] With the technique of (1), it consisted of only monochrome random patterns, and a significant image was not able to be superimposed on another image and record/playback of it were not able to be done. For example, the significant image with which the alphabetic character was drawn was not able to be superimposed on another landscape etc. For the reason, there was a problem that neither power of expression nor appearance was good etc.

[0007] The technique of (2) was premised on using what has mainly high redundancy, such as a natural image, for a main image, and it was difficult to be adapted for images with low redundancy, such as a pattern image which put the small image in order. Moreover, this technique is premised only on using the image used as the pair of two sheets, and was not able to enable complicated playback combining the image of three or more sheets.

[0008] moreover -- if the technique of (1) and (2) is copied with a copy machine -- the thing of an original copy -- ** -- the same effectiveness had been acquired. In addition, as a common technical problem, as a medium to record, a transparent thing is required and the adapted medium may have been restricted.

[0009] Commercial utilization of the technique of (1) and (2) was not actually carried out from an expression being scarce and an adaptation medium being restricted etc., having the big description that it can decode simple.

[0010] It was impossible for arithmetic units, such as a computer, to have been required for coding/decryption, and it to have decrypted information simply for digital data, with the technique of (3). Moreover, since an arithmetic unit was the need, it was difficult to make it low cost.

[0011] Let it be a technical problem that this invention cancels the fault of the starting conventional technique, and enables it to reproduce it easily [distribute and record various information on plurality, and].

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MEANS

[Means for Solving the Problem] It considers as the image generative system first characterized by providing a means to input the embedding-ed image which is an embedding image, a color picture, or a shade image as image data, a means to generate the share pattern which distributed the embedding image, and a means to embed a share pattern in an embedding-ed image, and to generate a share image at invention of claim 1 in order to attain the above-mentioned technical problem in this invention.

[0013] By moreover, the thing made equivalent [one or more auxiliary pixels] to a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 2, and each pixel of an embedding image By deleting the pixel of the embedding-ed image corresponding to a part for the specific color part of a means to generate the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern, and making it transparence A share pattern is embedded in an embedding-ed image, and it considers as the image generative system characterized by providing a means to generate a share image.

[0014] Moreover, a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 3, and to amend the gradation of an embedding image, By the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image By deleting the pixel of the embedding-ed image corresponding to a part for the specific color part of a means to generate the share pattern by which gradation amendment was carried out and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern, and making it transparence It considers as the image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[0015] By moreover, the thing made equivalent [one or more auxiliary pixels] to a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 4, and each pixel of an embedding image It transposes to a means to generate the share pattern which distributed the embedding image, and the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share pattern was set by arbitration. It considers as the image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[0016] Moreover, a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 5, and to amend the gradation of an embedding image, By the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image A means to generate the share pattern by which gradation amendment was carried out and which it embedded [pattern] and distributed the image, It transposes to the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share pattern was set by

arbitration, and considers as the image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[0017] By moreover, the thing made equivalent [one or more auxiliary pixels] to a means to input the embedding-ed image which are an embedding image and a pattern image of a color as image data in invention of claim 6, and each pixel of an embedding image By moving a means to generate the share pattern which distributed the embedding image, and the pixel of an embedding-ed image, based on one or more auxiliary pixels to which a share pattern corresponds It considers as the image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[0018] Moreover, in invention of claim 7, it considers as the image generative system characterized by to provide a means generate the share pattern which distributed the embedding image by making one or more auxiliary pixels equivalent to a means input an embedding image as image data, and each pixel of an embedding image, and a means make a hole in the part corresponding to the auxiliary pixel of the specific color of a share pattern, and output a share to a medium.

[0019] Moreover, while making one or more auxiliary pixels equivalent to a means to input an embedding image as image data, a means to memorize additional information, and each pixel of an embedding image, in invention of claim 8, embedding and distributing an image, it considers as the image generative system characterized by providing a means to make also embed additional information using the redundancy which exists in the response, and to generate a share pattern.

[0020] By moreover, the thing made equivalent [one or more auxiliary pixels] to a means to input an embedding image as image data, a means to memorize additional information, and each pixel of an embedding image, in invention of claim 9 A means to generate the share pattern which distributed the embedding image, and a means to express additional information by the two-dimensional pattern, and to divide into the auxiliary pixel of the specific color of a share pattern, It considers as the image generative system characterized by providing a means to generate a share image, by superimposing the two-dimensional pattern expressing the divided additional information corresponding to each auxiliary pixel of the specific color of a share pattern.

[0021] Moreover, a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 10, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of a means to generate the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern was embedded, and making it transparence It considers as the image generative system characterized by providing a means to embed a share pattern in the embedding-ed image with which the digital watermark was embedded, and to generate a share image.

[0022] Moreover, a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 11, and to amend the gradation of an embedding image, The digital watermark expressing additional information by the means embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of a means to generate the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern was embedded, and making it transparence It considers as the image generative system characterized by providing a means to embed a share pattern in the embedding-ed image with which the digital watermark was embedded, and to generate a share image.

[0023] Moreover, a means to input the embedding-ed image whose invention of claim 12 is an

embedding image and a color picture as image data, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image It transposes to the color to which the pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was determined as a means to generate the share pattern which distributed the embedding image by arbitration. It considers as the image generative system characterized by providing a means to embed a share pattern in an embedding-ed image, and to generate a share image.

[0024] Moreover, a means to input the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 13, and to amend the gradation of an embedding image, The digital watermark expressing additional information by the means embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image A means to generate the share pattern by which gradation amendment was carried out and which it embedded [pattern] and distributed the image, A means to transpose to the color to which the pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was set by arbitration, to embed a share pattern in an embedding-ed image, and to generate a share image, It considers as the image generative system characterized by providing.

[0025] Moreover, a means to input the embedding-ed image which are an embedding image and a pattern image of a color as image data in invention of claim 14, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image By moving the pixel of a means to generate the share pattern which distributed the embedding image, and the embedding-ed image which had the digital watermark embedded based on one or more auxiliary pixels to which a share pattern corresponds It considers as the image generative system characterized by providing a means to embed a share pattern in the embedding-ed image which had the digital watermark embedded, and to generate a share image.

[0026] Moreover, a means to input the embedding-ed image which are an embedding image and a shade image as image data in invention of claim 15, By making one or more auxiliary pixels equivalent to the means which carries out bottom raising of the number of pixels of the whole embedding-ed image, and each pixel of an embedding image A means to generate the share pattern which distributed the embedding image, and when it rasterizes an embedding image and a halftone dot is generated By embedding so that the include angle of a halftone dot may be set up according to the color of the auxiliary pixel of the share pattern corresponding to each halftone dot, and adjusting an image It considers as the image generative system characterized by providing a means to embed a share pattern in an embedding image and to generate a share image, and a means to rasterize a share image.

[0027] Moreover, in invention of claim 16, it considers as claims 1-6 and the image generative system of 9-14 given in any 1 term which are characterized by providing a means to output a share.

[0028] Moreover, in invention of claim 17, it considers as the image generative system according to claim 8 characterized by providing a means to output a share, based on a share pattern.

[0029] Moreover, in invention of claim 18, it considers as the image generative system according to claim 15 characterized by providing a means to output a share, based on the rasterized share image.

[0030] Moreover, in invention of claim 19, it considers as claim 7 and the image generative system of 16-18 given in any 1 term which are characterized by providing a means to give the device which makes playback easy to a share.

[0031] Moreover, in invention of claim 20, the above-mentioned device considers as the image

generative system given in claim 19 term characterized by being adding the mark for alignment to a share.

[0032] Moreover, in invention of claim 21, the above-mentioned device considers as the image generative system given in claim 19 term characterized by being applying adhesion material to one side of a share.

[0033] Moreover, in invention of claim 22, when the above-mentioned device outputs a share, it considers as the image generative system according to claim 19 characterized by being detaching spacing of pixels before that.

[0034] Moreover, in invention of claim 23, it considers as the image generation method characterized by including the process which inputs the embedding-ed image which is an embedding image, a color picture, or a shade image as image data, the process which generates the share pattern which distributed the embedding image, and the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0035] By the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 24, and moreover, making one or more auxiliary pixels equivalent to each pixel of an embedding image By deleting the pixel of the embedding-ed image corresponding to a part for the specific color part of the process which generates the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern, and making it transperence It considers as the image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0036] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 25, and amends the gradation of an embedding image, By the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image By deleting the pixel of the embedding-ed image corresponding to the specific color of the process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern, and making it transperence It considers as the image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0037] By the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 26, and moreover, making one or more auxiliary pixels equivalent to each pixel of an embedding image It transposes to the process which generates the share pattern which distributed the embedding image, and the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share pattern was set by arbitration. It considers as the image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0038] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 27, and amends the gradation of an embedding image, By the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image The process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, It transposes to the color to which the pixel of the embedding-ed image corresponding to a part for each color part of each auxiliary pixel of a share pattern was set by arbitration, and considers as the image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0039] By the process which inputs the embedding-ed image which are an embedding image and a pattern image of a color as image data in invention of claim 28, and moreover, making one or more auxiliary pixels equivalent to each pixel of an embedding image By the process which generates the

share pattern which distributed the embedding image, and moving the pixel of an embedding-ed image based on one or more auxiliary pixels to which a share pattern corresponds. It considers as the image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0040] Moreover, in invention of claim 29, it considers as the image generation method characterized by to include the process which generates the share pattern which distributed the embedding image by the process which inputs an embedding image as image data, and making one or more auxiliary pixels equivalent to each pixel of an embedding image, and the process which makes a hole in the part corresponding to the auxiliary pixel of the specific color of a share pattern, and outputs a share to a medium.

[0041] Moreover, while making one or more auxiliary pixels equivalent to the process which inputs an embedding image as image data, the process which memorizes additional information, and each pixel of an embedding image in invention of claim 30, embedding and distributing an image, it considers as the image generation method characterized by including the process which is made to also embed additional information using the redundancy which exists in the response, and generates a share pattern.

[0042] By invention of claim 31, by the process which inputs an embedding image as image data, the process which memorizes additional information, and moreover, making one or more auxiliary pixels equivalent to each pixel of an embedding image. The process which generates the share pattern which distributed the embedding image, and the process which expresses additional information by the two-dimensional pattern, and is divided into the auxiliary pixel of the specific color of a share pattern, It considers as the image generation method characterized by things including the process which generates a share image by superimposing the two-dimensional pattern expressing the divided additional information corresponding to each auxiliary pixel of the specific color of a share pattern.

[0043] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 32, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image. By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of the process which generates the share pattern which distributed the embedding image, and each auxiliary pixel of a share pattern was embedded, and making it transparency. It considers as the image generation method characterized by including the process which embeds a share pattern in the embedding-ed image with which the digital watermark was embedded, and generates a share image.

[0044] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 33, and amends the gradation of an embedding image, The digital watermark expressing additional information by the means embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image. By deleting the pixel of the embedding-ed image with which the digital watermark corresponding to a part for the specific color part of the process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, and each auxiliary pixel of a share pattern was embedded, and making it transparency. It considers as the image generation method characterized by including the process which embeds a share pattern in the embedding-ed image with which the digital watermark was embedded, and generates a share image.

[0045] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 34, By making one or more auxiliary pixels equivalent to the means which embeds the digital watermark expressing additional information in an embedding-ed image, and each pixel of an embedding image. It transposes to the color to which the

pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was determined as the process which generates the share pattern which distributed the embedding image by arbitration. It considers as the image generation method characterized by including the process which embeds a share pattern in an embedding-ed image, and generates a share image.

[0046] Moreover, the process which inputs the embedding-ed image which are an embedding image and a color picture as image data in invention of claim 35, and amends the gradation of an embedding image, The digital watermark expressing additional information by the process embedded in an embedding-ed image, and the thing by which gradation amendment was carried out and which you embed and is made equivalent [one or more auxiliary pixels] to each pixel of an image The process which generates the share pattern by which gradation amendment was carried out, and which it embedded [pattern] and distributed the image, The process which transposes to the color to which the pixel of the embedding-ed image which had the digital watermark corresponding to a part for each color part of each auxiliary pixel of a share pattern embedded was set by arbitration, embeds a share pattern in an embedding-ed image, and generates a share image, ***** -- it considers as the image generation method characterized by things.

[0047] Moreover, the process which inputs the embedding-ed image which are an embedding image and a pattern image of a color as image data in invention of claim 36, By the process which embeds the digital watermark expressing additional information in an embedding-ed image, and making one or more auxiliary pixels equivalent to each pixel of an embedding image By the process which generates the share pattern which distributed the embedding image, and moving the pixel of the embedding-ed image which had the digital watermark embedded based on one or more auxiliary pixels to which a share pattern corresponds It considers as the image generation method characterized by including the process which embeds a share pattern in the embedding-ed image which had the digital watermark embedded, and generates a share image.

[0048] Moreover, the process which inputs the embedding-ed image which are an embedding image and a shade image as image data in invention of claim 37, By the process which carries out bottom raising of the number of pixels of the whole embedding-ed image, and making one or more auxiliary pixels equivalent to each pixel of an embedding image The process which generates the share pattern which distributed the embedding image, and when it rasterizes an embedding image and a halftone dot is generated By embedding so that the include angle of a halftone dot may be set up according to the color of the auxiliary pixel of the share pattern corresponding to each halftone dot, and adjusting an image It considers as the image generation method characterized by including the process which embeds a share pattern in an embedding image and generates a share image, and the process which rasterizes a share image.

[0049] Moreover, in invention of claim 38, it considers as claims 23-28 and the image generation method of 31-36 given in any 1 term which are characterized by including the process which outputs a share based on a share image.

[0050] Moreover, the image generation method according to claim 30 characterized by including the process which outputs a share in invention of claim 39 based on a share pattern.

[0051] Moreover, in invention of claim 40, it considers as the image generation method according to claim 37 characterized by including the process which outputs a share based on the rasterized share image.

[0052] Moreover, in invention of claim 41, it considers as claim 29 and the image generation method of 38-40 given in any 1 term which are characterized by including the process which gives the device which makes playback easy to a share.

[0053] Moreover, in invention of claim 42, the above-mentioned device considers as the image generation method given in claim 41 term characterized by being adding the mark for alignment to a

share.

[0054] Moreover, in invention of claim 43, the above-mentioned device considers as the image generation method according to claim 41 characterized by being applying adhesion material to one side of a share.

[0055] Moreover, in invention of claim 44, when the above-mentioned device outputs a share, it considers as the image generation method according to claim 41 characterized by being detaching spacing of pixels before that.

[0056] Moreover, in invention of claim 45, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets on which the color or the shade image is recorded, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[0057] Moreover, in invention of claim 46, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets on which the pattern image of a color is recorded, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[0058] Moreover, in invention of claim 47, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets which the hole is opening, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[0059] Moreover, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets as which the additional information which is not in sight by arrangement of each pixel with the naked eye is expressed, only for an image appearing, recording an image, embedding in invention of claim 48 even if it piles up the share of less than k sheets, and an image not appearing.

[0060] Moreover, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets to which the share of the image of a color with which the digital watermark expressing additional information is embedded in invention of claim 49 is carried out, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[0061] Moreover, it considers as the record object characterized by embedding if the share of k or more sheets is piled up among the shares of n sheets on which the pattern image of a color with which the digital watermark expressing additional information is embedded in invention of claim 50 is recorded, for an image appearing, embedding even if it piles up the share of less than k sheets, and an image not appearing.

[0062] Moreover, it considers as the record object characterized by embedding even if it will embed when moire occurs, and an image will appear and it will pile up the share of less than k sheets, if the share of k or more sheets is piled up in invention of claim 51 among the shares of n sheets on which the shade image is recorded, and an image not appearing.

[0063] Moreover, in invention of claim 52, it considers as the record object of claim 45-51 characterized by having given the device which makes playback easy to a share given in any 1 term.

[0064] Moreover, in invention of claim 53, the above-mentioned device considers as the record object according to claim 52 characterized by being having added the mark for alignment to the share.

[0065] Moreover, in invention of claim 54, the above-mentioned device considers as the record object according to claim 52 characterized by being having applied adhesion material to one side of a share.

[0066] Moreover, in invention of claim 55, the above-mentioned device considers as the record object according to claim 52 characterized by being that spacing of the pixels on which the share is recorded is separated.

[0067]

[Embodiment of the Invention] (Operation gestalt common on the whole) The whole concerning the image generative system of claim 1, the image generation method of claim 23, and the record object of claim 45 explains a common operation gestalt first.

[0068] The physical configuration of the image generative system applied to this operation gestalt at drawing 1 is shown. This image generative system consists of CPU101, an image memory 102, the image input section 103, program memory 104, and the image recording section 105, and these are all connected by the bus 106. The image-processing section 107 is constituted by CPU101, an image memory 102, the image input section 103, and program memory 104.

[0069] If actuation of this image generative system is explained briefly, it will embed through the image input section 103 first, and an image and an embedding-ed image will be written in the predetermined field of an image memory 102, respectively. And based on the algorithm shown below, computation is given to these images, a share image is created, and a share is outputted by recording this share image on a record medium in the image recording section 105, or recording in forms, such as printing.

[0070] All of these the processings of a series of are performed by CPU according to the program stored in program memory 104. In addition, although the equipment of dedication may be used for processing, general-purpose computers, such as a personal computer, may be used. In this case, as for an image memory 102 and program memory 104, it is common to divide a field and to use the same memory.

[0071] The mimetic diagram of the flow of these processings is shown in drawing 19. A share image is generated by an embedding image being first disassembled into a share pattern, and superimposing a share pattern on an embedding-ed image by drawing 19. And a share is generated with outputting a share image as a record object.

[0072] Next, the configuration of the embedding image which is an input image of this system, and an embedding-ed image, and the content and semantics of an image processing are explained to a detail.

[0073] An input image is usually expressed the same with being used for an expression by the calculating machine as digital information as which concentration was defined on each lattice point of a rectangular coordinate system. Here, biaxial [of a rectangular coordinate system] is made into a x axis and the y-axis, and it is expressed as width and length for convenience, respectively.

[0074] You may be a color picture although a gray scale image and a monochrome binary image are fundamentally used as an embedding image with this operation gestalt. The concentration value of a pixel (x y) is expressed as $P(x y)$. In the case of a monochrome binary image, the pixel at $P(x y) = 1$ with a black and white pixel is set to $P(x y) = 0$. To a share pattern, it embeds like drawing 2, and one or more auxiliary pixels exist in it to 1 pixel of an image. In the example of drawing 2, four auxiliary pixels correspond to 1 pixel. This auxiliary pixel is a monochrome binary image, and expresses the auxiliary pixel corresponding to the embedding image $P(x y)$ as $Q(x y, r)$. Here, r is one or more integers by the auxiliary pixel number. Moreover, a color picture and a gray scale image are used for an embedding-ed image.

[0075] However, more generally with this operation gestalt, it can extend to a binary image and a shade image. A binary image means that the pair of the black in a monochrome binary image and white may be changed into the combination of two colors, such as blue, white, red and white, blue, and yellow. In this case, upper $P(x y)$ will mean the pixel of the 1st color at the time of $P(x y) = 1$, and the pixel of the 2nd color will be meant at the time of $P(x y) = 0$. For example, when using the pair of blue and yellow, $P(x y) = 1$ means a blue pixel, and $P(x y) = 0$ means a yellow pixel.

[0076] Similarly, by the shade image, the concentration value of the 1st color in a pixel (x y) is expressed by $P(x y)$, and the concentration value of the 2nd color in a pixel (x y) is expressed by $1-P(x y)$. For example, when using the pair of blue and yellow instead of the pair of white and black, $P(x$

y) expresses the concentration value of the blue in a pixel (x y), and $1-P(x y)$ expresses the concentration value of the yellow in a pixel (x y). This shade image is the gentle escape of a gray scale image. It is because it is thought that it is possible that $P(x y)$ expresses the concentration value of the black in a pixel (x y) with a gray scale image, and another side $1-P(x y)$ expresses the concentration value of the white in a pixel (x y).

[0077] When using a binary image and a shade image, an auxiliary pixel becomes the binary image which consists of two colors. For example, in the case of the shade image which consists of the binary image or two colors which consist of two colors using the pair of blue and yellow, it becomes the binary image with which an auxiliary pixel also consists of a pair of blue and yellow.

[0078] Although it describes on these descriptions below when mainly using a monochrome binary image or a gray scale image since it is simple, more, generally, a monochrome binary image can be extended to a binary image, and a gray scale image can be extended to a shade image.

[0079] Next, the algorithm of the image processing in this operation gestalt is explained according to the flow chart of drawing 3.

[0080] 1st step (S1); -- the ON of an embedding image and an embedding-ed image -- it is not strained but an embedding image and an embedding-ed image are inputted as digital data. When the image already serves as digital data, it changes into a graphics format suitable as it is. In the case of hard copy, a film photo, etc., an image reads with a digital scanner, and inputs them as digital data.

[0081] The 2nd step (S2); based on generation, next the embedding image of a share pattern, for example, a vision decode mold secrecy variational method is used, and a share pattern is generated. It is possible to reproduce an embedding image with the combination of a share pattern. Moreover, it is also possible to make an embedding image into two or more sheets by recombination of the pair of a share pattern. In generation of a share pattern, a random number is generated first. Pseudo-random numbers, such as an M sequence, are used as a generating means of a random number. And combination of a share pattern is chosen according to the random number. Since the selection approach of combination changes with each operation gestalten, explanation of each operation gestalt describes it.

[0082] The 3rd step (S2); a share pattern is embedded in superposition processing of an image, next an embedding-ed image, and a final share image is generated. This superposition processing changes with each operation gestalten, and explanation of each operation gestalt describes it.

[0083] The 4th step (S3); at amendment processing of a share image, next the 4th step, the share image expressed of the color component of RGB is changed into the amount signal of ink used in order to print as an amount of ink of four colors of YMCK in the image recording section. This conversion is conventionally known widely as a color conversion technique. In addition, if it processes with the YMCK base from the beginning, processing of the 4th step can be excluded. Moreover, this processing is unnecessary, when making a hole in the medium instead of the amount signal of ink and recording a share image on it.

[0084] Although software processing realized a series of share image generation processings in the above explanation, realizing by hardware is also possible. Drawing 4 is the configuration of the image generative system which realizes a series of share image generation mentioned above by hardware.

[0085] Two image memories which store an embedding image and an embedding-ed image, the share pattern generating section which generates a share pattern, the image superposition section which superimposes an image, the amendment processing section which performs amendment processing of a share image, and the image recording section which records an image are put together, and an image generative system is constituted.

[0086] First, an embedding image is digital-data-ized and is stored in an image memory 1. Similarly, an embedding-ed image is also digital-data-ized and is stored in an image memory 2. Next, in the

share pattern generating section, a random number is generated and a share pattern is generated according to a random number based on the embedding image data inputted from an image memory 1. The generation method of a share pattern changes with each operation gestalten, and is described in detail explanation of each operation gestalt. In the image superposition section, the share pattern generating section to a share pattern is inputted, an image memory 2 to an embedding-ed image superimposes these images, and a share image is generated. And next, a share image flows in the image amendment section, and RGB data are changed into the data of YMCK. Finally, a share image outputs a share by being recorded on a medium with gestalten, such as hard copy, in the image recording section.

[0087] Thus, it is possible to realize the aforementioned image processing easily also by hardware. If hardware is used, it is possible to perform an image processing at a high speed, and it is effective when especially the share of a large quantity needs to be generated.

[0088] Next, the regenerative apparatus which reproduces an embedding image is concretely explained from the share recorded through the share image as mentioned above.

[0089] Drawing 5 is drawing having shown the example of 1 configuration of a regenerative apparatus. A regenerative apparatus is loaded with a share and it fixes. Thereby, shares are fixed to position relation. By observing this fixed share, it embeds from a share, an image is compounded and it can recognize. Moreover, it is possible to make playback clearer by arranging the light source of an electric bulb etc. in the lower part of a regenerative apparatus. In addition, as long as a regenerative apparatus can fix the physical relationship of not only a configuration as shown in drawing 5 but a share, what kind of structure is sufficient as it.

[0090] Next, an easy example is taken and the principle which is embedded with a regenerative apparatus and by which an image is reproduced is explained. As an example, the case where use a monochrome binary image as an embedding image, and a plain image is used as an embedding-ed image is described.

[0091] When the share image recorded at the time of playback is piled up, it looks visually in the form where embedded into the embedding-ed image and the image lapped. In the case of this example, the generated share image also turns into a monochrome binary image. And according to the lap condition of the shares of each pixel, the pixel looks white to human being's eyes like drawing 6 , or it sees black. Therefore, about the black pixel of an embedding image, it becomes possible by constituting a share pattern so that it may look black at the time of playback, and constituting a share pattern so that it may look white about the white pixel of an embedding image at the time of playback to reproduce an embedding image by human being's eyes. It becomes important to take the sufficiently large contrast ratio of two parts so that a black part and a white part can be easily distinguished to human being's eyes at this time. In addition, although the pair of black and white explained in this example, it is possible to acquire the same effectiveness also in combination, such as the combination of other colors, for example, blue, white, red and white, blue, and yellow. Henceforth the pair of black and white explains fundamentally, and the combination of other colors is also possible.

[0092] In addition, it is possible to make it make alignment at the time of playback easy by adding the mark for alignment as shown in a medium at drawing 7 as a device make it easy to reproduce, a location not shift simply, etc., once piling up by applying weak adhesion material to one side of a share. Moreover, as shown in drawing 8 , the device make effect by blurring etc. hard to be influenced is also effective as a thing which make it easy to reproduce by detaching a pixel and arranging what connected and arranged pixels conventionally.

[0093] From a degree, concrete processing is shown according to each operation gestalt.

[0094] (1st operation gestalt) The 1st [concerning the image generative system of claims 2-5 and the image generation method of claims 24-27] operation gestalt is explained first. With this operation

gestalt, a gray scale image is used as an embedding image. And a color picture is used for an embedding-ed image. With this operation gestalt, since a color picture is used as an embedding-ed image, in the example of drawing 6 , at the time of playback, a color will take lessons from the black part of drawing 6 , and the colorless or same color will attach a white part. Visually, the part of the colorless or same color becomes possible [other parts being distinguished, and it being recognized and recognizing an embedding image].

[0095] Next, the algorithm of the image processing in this operation gestalt is explained to a detail along with the flow chart of drawing 3 .

[0096] The 1st step (S1); (input of an embedding image and an embedding-ed image)

An embedding image and an embedding-ed image are inputted as digital data. With this operation gestalt, an embedding image is inputted as a color picture as an embedding-ed image as a gray scale image. An embedding image is disassembled into an auxiliary pixel at the same time it is inputted. Generally, the number of pixels of an auxiliary pixel increases as gradation becomes fine. Although it is possible to express a smoother image by making [many] the number of gradation, when the number of auxiliary pixels increases, the magnitude of an auxiliary pixel becomes small and the alignment at the time of playback becomes difficult. Therefore, the number of gradation is made few to extent to which the quality of an image is not lowered, and it becomes important to maintain the magnitude and balance of an auxiliary pixel. Approaches, such as a "error diffusion method", are learned as preparation of gradation.

[0097] The 2nd step (S2); based on the embedding image which generated next amended [gradation] the share pattern, for example, a vision decode mold secrecy variational method is used, and a share pattern is generated. The combination of a share pattern enables it to reproduce an embedding image. Moreover, it is also possible to make an embedding image into two or more sheets by recombination of the pair of a share pattern. In generation of a share pattern, a random number is generated first. And combination of a share pattern is chosen according to the random number. The thing of the combination of a share pattern will be called a "set" after this. Like the example of drawing 9 , when there are four sets of combination of a share pattern, a set is chosen from 1 according to the random number which was made to generate the random number of 4 and was generated. Like drawing 9 , if two patterns are contained in one set, an embedding image will be distributed by the share pattern of two sheets. Selection of a set is chosen from a white set when the pixel of a corresponding embedding image is white, and when a pixel is black, it is chosen from a black set. This is performed about each pixel and a share pattern is generated about the whole screen. In this operation gestalt, an embedding image is a gray scale image by which gradation amendment was carried out, and the number of auxiliary pixels is determined according to the number of gradation. It is white and black, the example of drawing 9 is the case where the number of gradation is 2, and the number of sets also increases it as the number of gradation increases. An embedding image is distributed by two or more share patterns in this step.

[0098] The 3rd step (S3); in superposition processing of an image, next superposition processing of an image, a share pattern is embedded in an embedding-ed image, and a final share image is generated. Embedding is performed by leaving the pixel of the embedding-ed image corresponding to the black part of each auxiliary pixel of a share pattern, deleting the pixel corresponding to the white part of each auxiliary pixel of a share pattern, and making it transparence. If it is made for an embedding image to remain more at this time, the appearance of a final share will become good. For the reason, appearance will become good, if a share pattern is devised so that as black a part as possible may increase a pattern in the 2nd step. Moreover, if a certain specific color is applied instead of the pixel corresponding to the white part of a share pattern, it will embed instead of the appearance of a share being spoiled somewhat, and an image will be reproduced more vividly.

[0099] The 4th step (S4); in amendment processing of a share image, next the 4th step, the share image expressed of the color component of RGB is changed into the amount of ink of four colors of YMCK in the image recording section.

[0100] The above is a series of image processings in this operation gestalt, and outputs a share after this processing by recording a share image as record objects, such as hard copy, according to the amount signal of ink in the image recording section.

[0101] Playback is performed by using the regenerative apparatus of drawing 5 or doubling each share by people's hand.

[0102] (2nd operation gestalt) Next, the 2nd [concerning the image generative system of claim 6 the image generation method of claim 28, and the record object of claim 46] operation gestalt is explained. With this operation gestalt, the pattern image which put an image and an alphabetic character small as an embedding-ed image in order is used.

[0103] With this operation gestalt, as an embedding image, a monochrome binary image is used and the pattern image which put a small image and a small alphabetic character in order as an embedding-ed image is used. Since a pattern image had the low redundancy of an image, it was difficult for it to embed by the approach of the 1st operation gestalt and to reproduce an image vividly. The thing of a small image or an alphabetic character will be called a small pattern after this.

[0104] The property of the share image recorded with this operation gestalt is explained. The generated share image is a pattern image which put a small image and a small alphabetic character in order, according to the lap condition of each smallness pattern of shares, is different to human being's eyes like [in the case of the LOGO of drawing 10], and is observed. When a small pattern is put together exactly, the part looks whitish, and the part looks blackish when a small pattern shifted and is put together. As there is a pattern exactly about the white part of an embedding image, an embedding image can be observed with constituting a black part so that a pattern may shift.

[0105] Next, the algorithm of the image processing in this operation gestalt is explained to a detail according to the flow chart of drawing 3 .

[0106] The 1st step (S1); an embedding image, the input embedding image of an embedding-ed image, and an embedding-ed image are inputted as digital data. In this operation gestalt, an embedding image is inputted as a monochrome binary image, and a small pattern is actually inputted as a color picture as an embedding-ed image. An embedding-ed image carries out the average poor thing of this small pattern in all directions, and is interpreted.

[0107] The 2nd step (S2); a share pattern is generated based on an embedding image like the operation gestalt of the generation 1st of a share pattern. In the example in the case of the LOGO of drawing 10 , the number of auxiliary pixels is one to each pixel of an embedding image, and a share pattern is expressed by two kinds of right justification Rika left [LOGO]. Therefore, a share pattern is expressed with binary [of the black showing rightist inclinations, and the white showing the left]. Of course, a LOGO is able for the top left, top rightist inclinations, the bottom left, and bottom rightist inclinations to prepare four kinds, and to set the number of auxiliary pixels to two according to it.

[0108] The 3rd step (S3); a small pattern is arranged according to superposition processing of an image, next a share pattern, and a final share image is generated. That is, when there are N sets of combination of a share pattern, according to a share pattern, the combination of one set of the N sets is written in each share. This is performed to each pixel, it processes to all image screens, and a share image is generated. In the case of the LOGO of drawing 10 , a share pattern is two sets of the black showing rightist inclinations, and the white showing the left. A share pattern arranges a small pattern into a black part at rightist inclinations, and a share pattern arranges a small pattern into a white part at the left.

[0109] The 4th step (S4); RGB data are changed into the amount of ink of YMCK like the operation

gestalt of the amendment processing 1st of a share image.

[0110] The above is a series of image processings in this operation gestalt, and outputs a share after this processing by recording a share image as record objects, such as hard copy, in the image recording section like the 1st operation gestalt.

[0111] The playback approach is performed like the 1st operation gestalt.

[0112] (3rd operation gestalt) Next, the 3rd [concerning the image generative system of claim 7 the image generation method of claim 29, and the record object of claim 47] operation gestalt is explained. With this operation gestalt, a hole is made in the **** stiffness which records a share image as hard copy at a medium.

[0113] With this operation gestalt, as an embedding image, a monochrome binary image is used and an embedding-ed image is not used. However, it is possible to improve appearance by printing the image of arbitration on the medium which makes a hole. Moreover, although it is possible to also use a gray scale image as an embedding image, from the number of auxiliary pixels increasing, the magnitude of an auxiliary pixel becomes small, it becomes difficult to maintain the reinforcement when making a hole, or problems, like it becomes difficult to double a share at the time of playback come out. Although the sheet mainly transparent as a medium was used with the operation gestalt to the above-mentioned, in the case of this operation gestalt, it is possible to use an opaque thing.

[0114] The share by which generation record was carried out from the share pattern with this operation gestalt meets a pattern, and the hole is made. A pattern is observed by human being's eyes according to the lap condition of the hole of each pattern of shares. When a pattern is put together exactly, a hole opens, the part is visible, and when a pattern shifted and is put together, the part is visible where a hole is closed. An embedding image can be observed with constituting a black part so that a pattern may shift so that a pattern may suit the white part of an embedding image exactly.

[0115] Next, the algorithm of the image processing in this operation gestalt is explained to a detail along with the flow chart of drawing 11 .

[0116] The 1st step (S1); the input embedding image of an embedding image is read. An embedding image is inputted as a monochrome binary image. An embedding-ed image is not used with this operation gestalt.

[0117] The 2nd step (S2); like the operation gestalt of the generation 1st of a share pattern, based on an embedding image, for example, a vision decode mold secrecy variational method is used, and a share pattern is generated.

[0118] In this operation gestalt, the 3rd step (superposition processing of an image) and the 4th step (amendment processing of a share image) are unnecessary.

[0119] The above is a series of image processings in this operation gestalt, and outputs a share after this processing by making and recording a hole on a medium according to a share pattern in the image recording section.

[0120] Next, how to make a hole in a medium is explained. Either the black of a share pattern or a white pattern is chosen, and the hole of the suitable magnitude for the pattern part is made. As shown in the medium 1 which made the hole of drawing 12 , when making a hole, a frame is given and a hole is made. When a hole is made to the limit of the magnitude of the pixel of a pattern, in the case of a pattern which is in the medium 2 which made the hole of drawing 12 , this is because the black pixel of middle falls out, without preparing a frame. Moreover, if it leaves the part of an angle as shown in the medium 3 which made the hole of drawing 12 , the reinforcement of a frame can fully be maintained. The equipment which makes a hole in a medium can also generate a fine hole by making a hole by the puncher or using an etching technique.

[0121] Also in this operation gestalt, it embeds by the same approach as the 1st operation gestalt, and information is reproduced.

[0122] Although it was only the technique by the hard copy to a medium conventionally, this operation gestalt enabled it to be adapted also for an opaque medium, and it became possible to extend the application range.

[0123] (4th operation gestalt) Next, the image generative system of claims 8-14, the image generation method of claims 30-36, and the 4th [concerning claims 48-50] operation gestalt are explained. This approach makes it possible to embed into a share pattern and to embed the digital information of arbitration in addition to the information about an image. The digital information embedded apart from the information about an embedding image will be called "additional information" after this.

[0124] This operation gestalt can roughly be classified into two kinds. It is two although additional information is embedded as a digital watermark with what embeds additional information as a monochrome two dimensional code. Although an auxiliary pixel is further divided with the thing using a still more redundant share pattern and a two dimensional code is embedded when embedding additional information as a two dimensional code, there are two kinds.

[0125] (When embedding 4-a additional information as a two dimensional code) When embedding additional information as a monochrome two dimensional code, a monochrome binary image is used as an embedding image, and an embedding-ed image is not used. In this case, although not a monochrome binary image but the image of arbitration can also be used for an embedding image, playback of the additional information by equipment becomes difficult.

[0126] First, the algorithm of the image processing in the case of using a redundant share pattern is explained to a detail along with the flow chart of drawing 13 .

[0127] The 1st step (S1); the input embedding image of an embedding image is inputted. An embedding image is read. An embedding image is inputted as a monochrome binary image. An embedding-ed image is not used with this operation gestalt. On the other hand, it digitizes about additional information and records on memory apart from the image.

[0128] 2nd step (S2); -- generation of a share pattern, and superposition processing of an image -- when using a redundant share pattern, generation of a share pattern and superposition processing of an image are performed simultaneously. That is, a share pattern serves as a share image final as it is. Generation of the share pattern using a vision decode mold secrecy variational method is performed in two steps, pretreatment of additional information, and selection of a set. However, when using a redundant share pattern, a set will call [those with two kind, and] it a "set" and a "small set", respectively. The number of sets of drawing 14 is an example in case 3 and the small number of sets are 2. Although constituted from the 1st operation gestalt only using one set of the set of this operation gestalt, it is possible to embed additional information by preparing the number of sets for three redundancy with this operation gestalt. First, with pretreatment of additional information, information is changed according to the redundancy of a share pattern. In the example of drawing 14 , the number of sets is 3 and can distinguish three kinds per pixel. Although, as for digital information, the base is generally recorded by 2, the base changes additional information into the data of 3 in this case. Next, superposition in additional information is performed to the selection and coincidence of a small set by the random number. The set number chosen from the pretreated additional information is acquired, and the small set in a set is chosen by generating a random number. The share pattern of each pixel is determined as a meaning by this. A series of processings to each of this pixel are performed about all pixels.

[0129] In this operation gestalt, a share image is a monochrome binary image and image transformation processing like the 4th step (amendment processing of a share image) of the 1st operation gestalt is unnecessary.

[0130] The above is a series of image processings in this operation gestalt, and outputs a share after this processing by recording a share image as record objects, such as hard copy, in the image

recording section like the 1st operation gestalt.

[0131] next, the algorithm of the image processing in the case of dividing an auxiliary pixel further is boiled and explained according to the flow chart of drawing 15 . The difference with the case where a redundant share pattern is used is in the 2nd step and the 3rd step.

[0132] 1st step (S1); -- the input of an embedding image -- like the case where a redundant share pattern is used, an embedding image is inputted as a monochrome binary image, and an embedding-ed image is not used.

[0133] The 2nd step (S2); based on generation, next the embedding image of a share pattern, a vision decode mold secrecy variational method is used, and a share pattern is generated. A random number is generated like the 1st operation gestalt, and a set is chosen. Unlike the case where a redundant share pattern is used, a share pattern is generated, without dividing a set and a small set. And apart from generation of a share pattern, information is used as the two-dimensional pattern of white and black by making additional information into a two dimensional code. And this two-dimensional pattern is divided into the black number of auxiliary pixels of a share pattern.

[0134] The 3rd step (S3); in superposition processing of an image, next (superposition processing of an image) of the 3rd step, the share pattern generated at the 2nd step and a share pattern superimpose the two-dimensional pattern of the additional information generated independently, and generate a final share image. A share image is generated by specifically embedding the two-dimensional pattern divided into the black number of auxiliary pixels of a share pattern in the 2nd step into the black part of the auxiliary pixel of a share pattern. Drawing 16 expresses signs that additional information is added to the black part of each auxiliary pixel.

[0135] As well as the 1st operation gestalt when dividing an auxiliary pixel further, image transformation processing [like / the 4th step (amendment processing of a share image) of the 1st operation gestalt] is unnecessary, and outputs a share to recording a share image as record objects, such as hard copy, more in the image recording section after a series of image processings.

[0136] (When embedding 4-b additional information as a digital watermark) When embedding additional information as a digital watermark, a color picture is used for an embedding-ed image, using a gray scale image as an embedding image.

[0137] Although the algorithm of the image processing in this operation gestalt is the same as the approach fundamentally stated with the 1st operation gestalt or the 2nd operation gestalt, the points which embed a digital watermark in an embedding-ed image simultaneously at the time of the input of an embedding-ed image differ.

[0138] As an approach of putting in a digital watermark, the approach of of a "pixel space utilization mold", a "frequency-domain utilization mold", a "statistic utilization mold", etc., etc. is learned, and it is stated to reference (3).

[0139] Playback of the recorded information is also the same as when [also when embedding additional information as a two dimensional code] embedding as a digital watermark. Playback is divided into the part reproduced by people's eyes like the 1st operation gestalt, and the playback part of the additional information using a regenerative apparatus. Playback by human being's eyes is performed because shares pile up, and playback of additional information is performed using a regenerative apparatus.

[0140] The regenerative apparatus of additional information consists of the output section, as a result of displaying the image input section which reads a share, the image-processing section which processes the inputted result, and the processed result, as shown in drawing 17 .

[0141] The image input section can use a bar code scanner, a flat bed mold scanner, a drum-type scanner, etc. If a bar code scanner is used, inputting easily is possible and it is possible to constitute a regenerative apparatus comparatively cheaply. In the image-processing section, a response with the

information which corresponds the inputted image with a share pattern is taken, and additional information is decoded. And in the result output section, a result is outputted by the display on a display, printing by the printer, etc.

[0142] Although the approach which can be conventionally reproduced by people's eyes to embed information, and the approach of using equipments, such as a digital watermark, to embed information were not able to be united, it is possible to unite both advantage well with this operation gestalt.

[0143] (5th operation gestalt) Next, the 5th [concerning the image generative system of claim 15 the image generation method of claim 37, and the record object of claim 51] operation gestalt is explained. Although it embedded according to the lap condition of the color of shares and the image was reproduced with the old operation gestalt, with this operation gestalt, it is not a lap of a color, and it embeds according to the lap condition of a halftone dot, and an image is reproduced. a moire phenomenon cuts a halftone dot image with the include angle as known well conventionally. A lifting and an embedding image are reproduced for a moire phenomenon by adjusting the pattern of the include angle of a halftone dot.

[0144] With this operation gestalt, a monochrome binary image is used as an embedding image. Moreover, a gray scale image is used for an embedding-ed image. Although it is also possible to use a gray scale image as an embedding image, it is difficult to reproduce vividly.

[0145] Next, the algorithm of the image processing in this operation gestalt is explained to a detail along with the flow chart shown in drawing 3 .

[0146] The 1st step (S1); the input of an embedding image, the input embedding image of an embedding-ed image, and an embedding-ed image is performed. With this operation gestalt, an embedding image is inputted as a gray scale image as a monochrome binary image and an embedding-ed image. An embedding-ed image performs processing to which an image becomes dark on the whole after an input. When an image is halftone-dot-ized in processing after this, this is because a clear moire phenomenon cannot be caused, if there is not sufficient pixel value. When bottom raising of a pixel value is carried out as a whole and shares are piled up so that contrast of an image may not be spoiled if possible, it adjusts so that the moire phenomenon which can fully be checked by people's eyes can be caused.

[0147] The 2nd step (S2); based on generation, next the embedding image of a share pattern, for example, a vision decode mold secrecy variational method is used, and a share pattern is generated. The set of a share pattern is divided into the set which starts moire when a share is piled up, and the set which does not start moire, and expresses each by the black pixel as a share pattern, and the white pixel. Moreover, it is also possible to carry out a richer expression with the reinforcement of moire by the increase of the number of sets or carrying out and increasing the number of auxiliary pixels of a share pattern according to it.

[0148] The 3rd step (S3); superposition processing of an image, next superposition processing of a share pattern and an embedding-ed image are performed. Actually, the include angle of a halftone dot is changed according to a share pattern, and the consistency of a halftone dot is adjusted with the concentration value of an embedding-ed image. For example, a share pattern sets a black part as the include angle 0 of a halftone dot, and sets a white part as 45 include angles of a halftone dot. When shares are piled up, a moire phenomenon is not generated when the include angle of a halftone dot is the same but the include angles of a halftone dot differ so that it may illustrate to drawing 18 , a moire phenomenon occurs, and an embedding image can be recognized. In addition, if the consistency of a halftone dot is too small, since sufficient moire will not occur but playback will become difficult, it is necessary to carry out image restoration so that consistency sufficient at the 3rd step may be secured.

[0149] amendment **** of a 4th step (S4); share image -- at this step, it changes into the raster data for outputting a halftone dot image based on the image created in the 3rd step. Conversion to raster

data is performed by processing called rasterizing [which halftone-dot-izes an image].

[0150] The above is a series of image processings in this operation gestalt, and generates a share with outputting to a medium in the image recording section after this processing. As an output unit, there are film output machines, halftone dot printers, etc., such as an imagesetter.

[0151] Also in this operation gestalt, it embeds by the same approach as the 1st operation gestalt, and information is reproduced.

[0152] With the conventional technique, although it was difficult for a copy to generate a difficult share with a copy machine etc., it became possible by using a halftone dot like this operation gestalt to carry out easy reproduction in a copy machine etc. by the ability not doing.

[0153]

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The block diagram showing the physical configuration of the image generative system of this invention.

[Drawing 2] The explanatory view explaining one example of the auxiliary pixel corresponding to a pixel.

[Drawing 3] The flow chart which shows the flow of the fundamental image processing by the image generative system of this invention.

[Drawing 4] The block diagram showing the configuration when realizing by the hardware of dedication of the image generative system of this invention.

[Drawing 5] The explanatory view showing the example of 1 configuration of a regenerative apparatus.

[Drawing 6] The explanatory view showing the principle by which an embedding image is reproduced.

[Drawing 7] The explanatory view which illustrates the mark for alignment.

[Drawing 8] The explanatory view which illustrates detaching and arranging spacing of a pixel.

[Drawing 9] The explanatory view showing the example of generating of a share pattern.

[Drawing 10] The explanatory view showing the principle which is embedded when a small pattern is a LOGO, and by which an image is reproduced.

[Drawing 11] The flow chart which shows the flow of the image processing in the 3rd operation gestalt.

[Drawing 12] The explanatory view showing how to make a hole to a medium.

[Drawing 13] The flow chart which shows the flow of the image processing in the case of embedding additional information using the redundancy of the share pattern of the 4th operation gestalt.

[Drawing 14] The explanatory view which illustrates the approach of embedding additional information using the redundancy of a share pattern.

[Drawing 15] The flow chart in the case of dividing an auxiliary pixel further with the 4th operation gestalt, and embedding a two dimensional code.

[Drawing 16] The explanatory view which illustrates the approach of embedding a two dimensional code into the black part of an auxiliary pixel with the 4th operation gestalt.

[Drawing 17] The block diagram showing the configuration of the regenerative apparatus of additional information.

[Drawing 18] The explanatory view which illustrates the principle which is embedded by moire, and by which an image is reproduced.

[Drawing 19] The explanatory view showing the processing process of the image by the image generative system of this invention.

[Description of Notations]

101 -- CPU

102 -- Image memory

103 -- Image input section

104 -- Program

105 -- Image recording section

106 -- Bus

107 -- Image-processing section

[Translation done.]

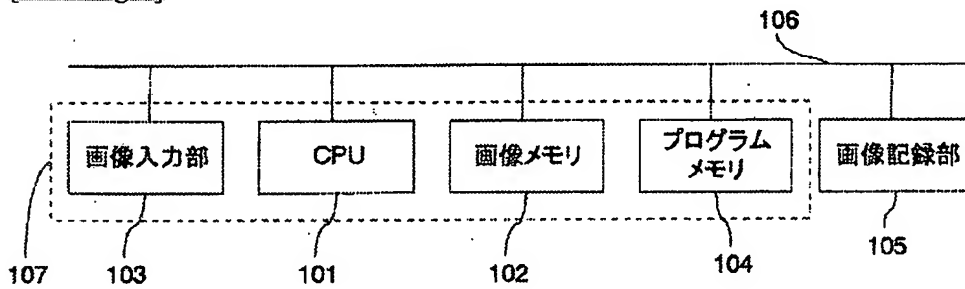
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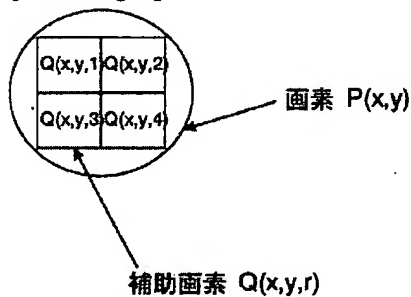
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- 3.In the drawings, any words are not translated.

DRAWINGS

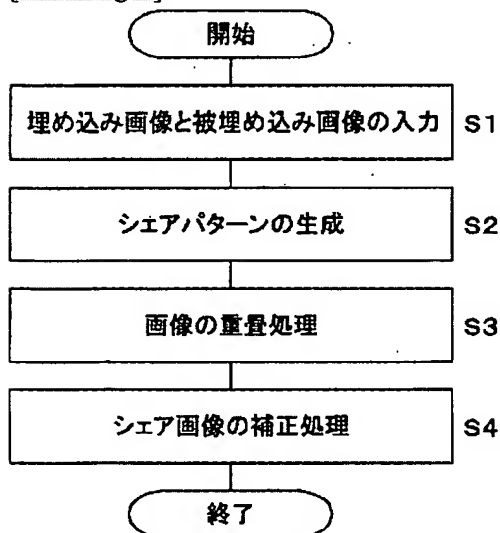
[Drawing 1]



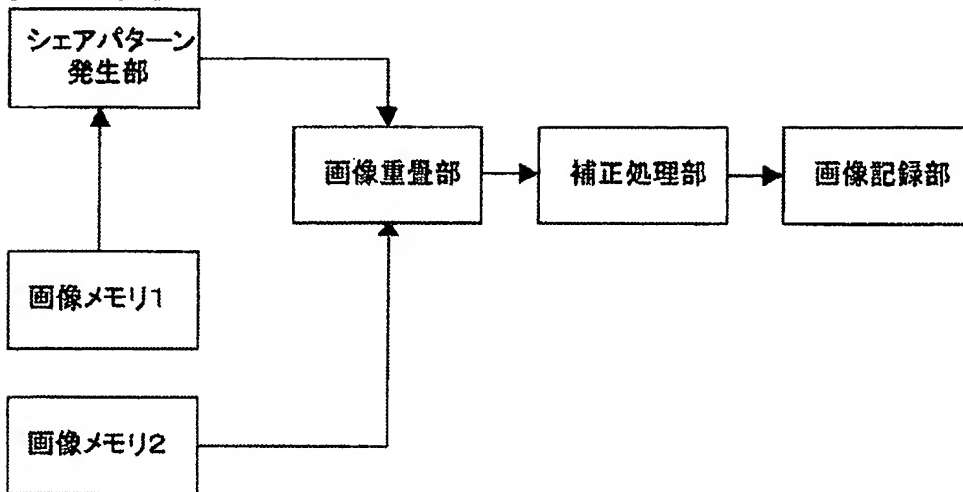
[Drawing 2]



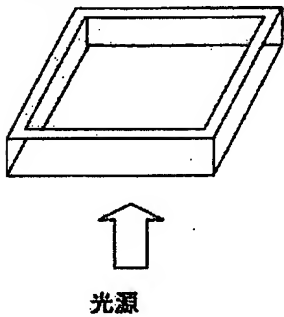
[Drawing 3]



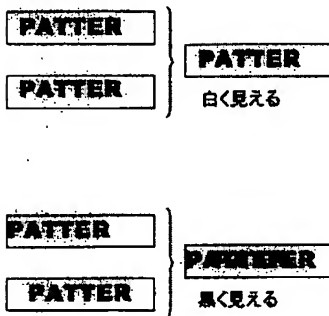
[Drawing 4]



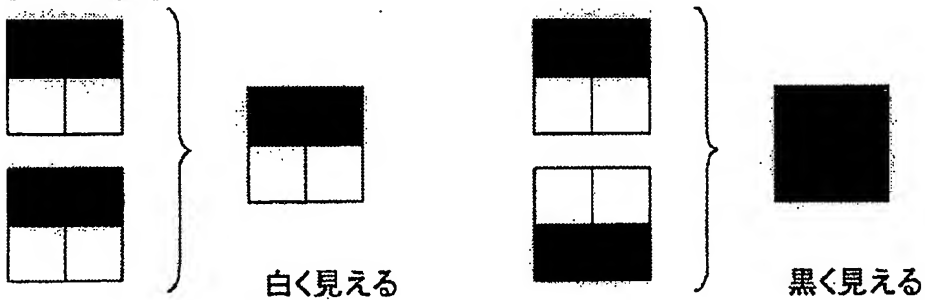
[Drawing 5]



[Drawing 10]

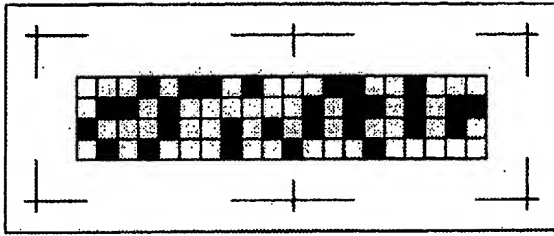


[Drawing 6]

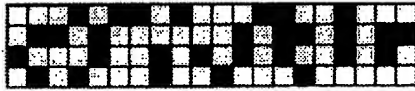


[Drawing 7]

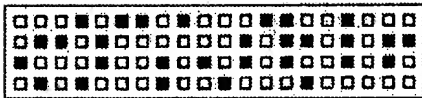
4. 1.2



[Drawing 8]



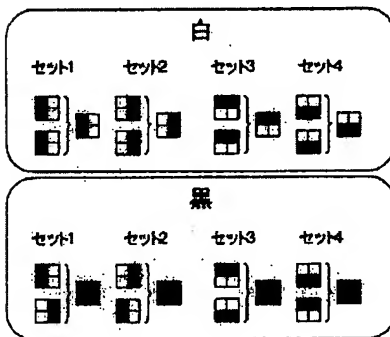
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画素同士を離して配置

[Drawing 9]

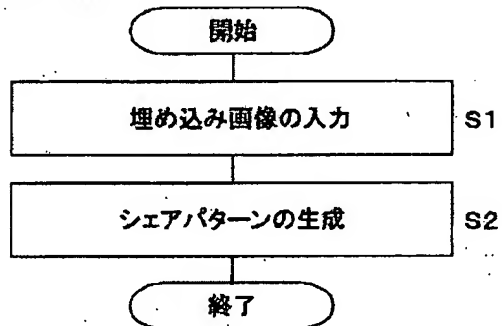
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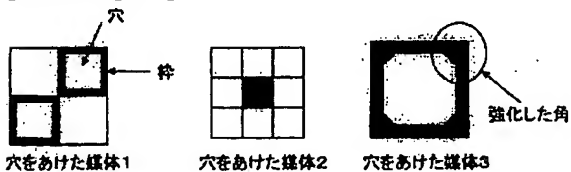
乱数に従って決定

セット1	セット3
セット2	セット4

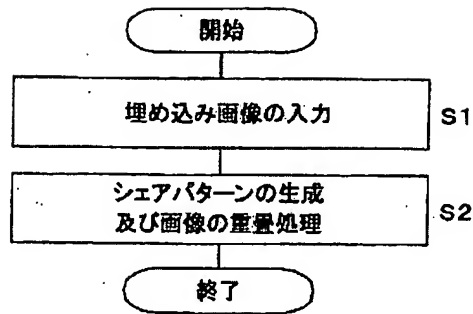
[Drawing 11]



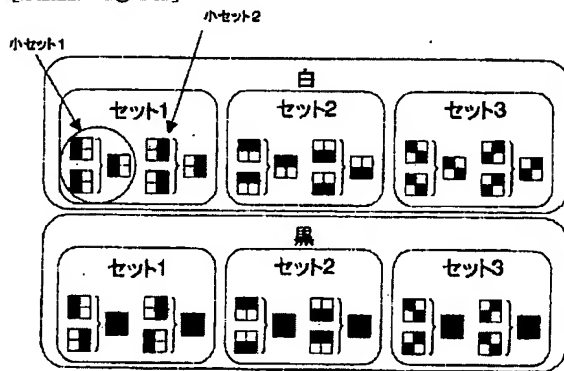
[Drawing 12]



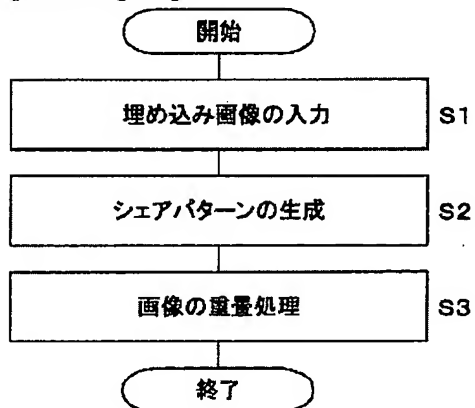
[Drawing 13]



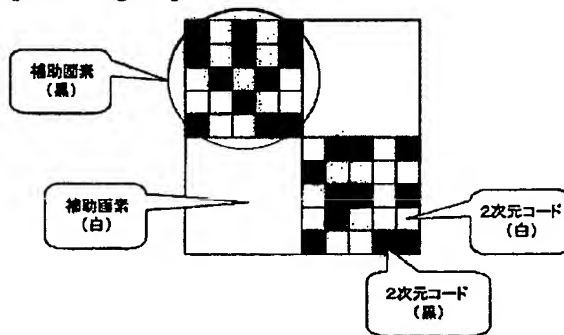
[Drawing 14]



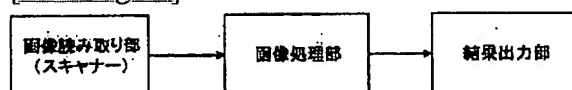
[Drawing 15]



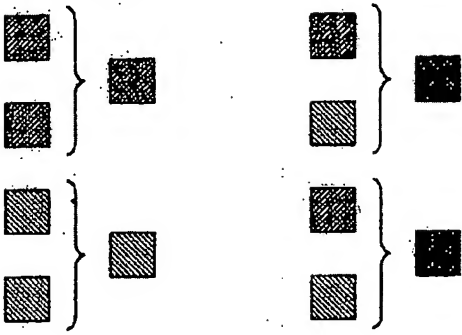
[Drawing 16]



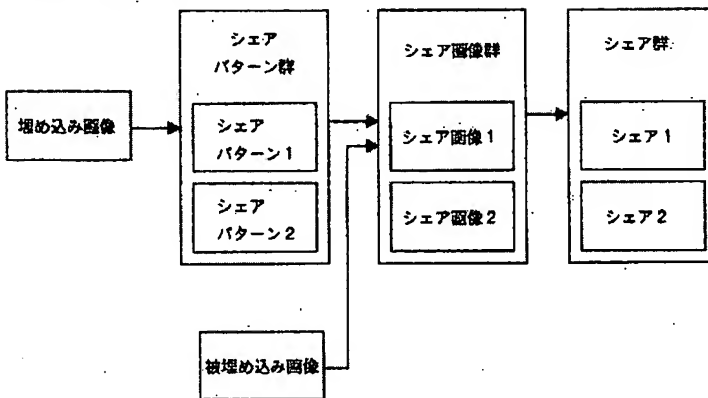
[Drawing 17]



[Drawing 18]



[Drawing 19]



[Translation done.]